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SOCIAL PROCESSES IN PHYSICIANS' ADOPTION OF A NEW DRUG

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OVER the past 20 years the practice of medicine has undergone profound changes, not the least of which has been the accelerated rate of change itself. Again and again, new diagnostic techniques, new laboratory tests, new drugs, new forms of anesthesia, new surgical procedures, and new principles of patient management make their appearance. Most of these innovations are minor steps which alter the medical scene only by gradual accretion, if at all; many, indeed, are short-lived or quickly superseded; a few have been milestones in medical developments. Whatever the ultimate significance of a new practice may be, its immediate fate, once it has been launched from the laboratory or research clinic, rests in the hands of the practicing physician in the field.

The pathways by which a successful innovation in medical practice spreads through the profession have seldom been systematically investigated. The present study is a contribution toward that end. It concerns the fate of a single innovation in four cities, a new variant in a well-established family of drugs. Such a case study can hardly claim to represent the course of all types of medical innovations under all circumstances, but it does illuminate some important paths

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and processes through which medical innovations can make their way into the practice of physicians. One may add that drugs are peculiarly suitable as tracers of these paths, because they are physical objects with standardized names, their release dates are easily ascertainable, and pharmacists maintain exact prescription records.

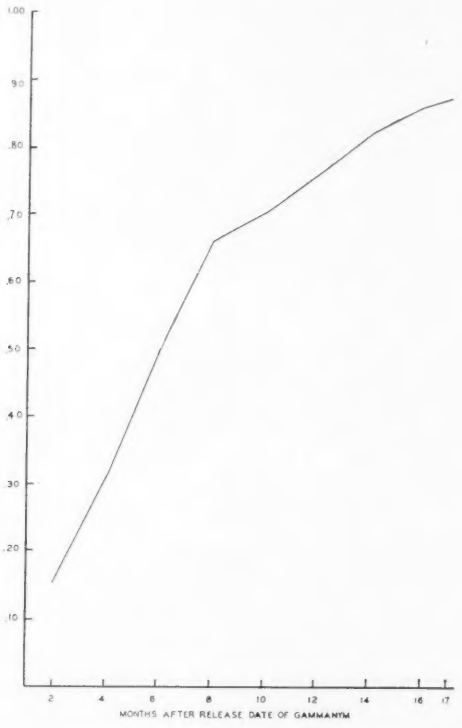

Fig. 1.—Cumulative proportion of doctors introducing gammanym over a 16-month period (N = 125).

The data of this study stem from two sources. In four midwestern communities, interviews were conducted with 125 general practitioners, internists, and pediatricians, who generously contributed an average of 1½ hours of their time. They constituted 85 per cent of all practitioners of their specialties in these cities. In addition, data on the prescriptions written by these 125 physicians were obtained from almost all the pharmacies in these communities.* The prescription data covered a period of 16 months beginning with the release date of a new drug which will here be called "gammanym." At this time two older drugs of the same general type were in widespread use. They had appeared some years earlier and are here designated as "alphanym" and "betanym." The three

*Ninety-one additional interviews were held with practitioners of other specialties, but their prescription record was not examined. The communities had altogether 356 physicians in active private practice. The sample was designed to include all the general practitioners, internists, and pediatricians, and a selected group of other specialists. The population of the four cities ranged from about 25,000 to just over 100,000.

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medications belong to a well-established family of drugs which has widespread applicability in the hands of general practitioners and many specialists. By the end of the survey period, 16 months after its release, gammanym had become at least a part of the standard medication of most practicing physicians; 87 per cent of the general practitioners, internists, and pediatricians in the sample under study had introduced it into their practice. But this change had been neither immediate nor all-encompassing. The over-all rate of introduction of gammanym by these doctors is seen in Fig. 1. This cumulative curve indicates for each stated date the percentage of doctors who had already prescribed the drug up to that time. As can be seen, more and more doctors introduced the drug during this 16-month period until almost 90 per cent had used it; then the curve finally leveled off.

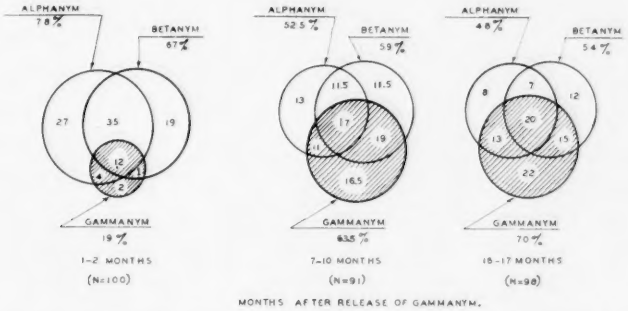

Fig. 2.—Overlapping use of alphanym, betanym, and gammanym during three time intervals.

To be sure, the rapid rise in the use of gammanym did not mean that its predecessors, alphanym and betanym, were dropped from use. The degree of overlapping use of two or three of the drugs by the same doctor is pictorially represented in Fig. 2, for three time intervals, representing the beginning, middle, and end of the period studied. Thus, for example, as late as 16 and 17 months after the release of gammanym,* only 22 per cent of the doctors were prescribing gammanym exclusively, while 15 per cent were prescribing both betanym and gammanym, 13 per cent were prescribing both alphanym and gammanym, and 20 per cent were writing prescriptions for all three drugs during these same 2 months (more accurately, during the 6 sampling days representing these 2 months). The introduction of gammanym meant for most doctors an addition to whatever drugs of this type they were already using, rather than a substitution. Only slowly, if at all, did some of the doctors stop using the older drugs.

DRUG ADOPTION AND INDIVIDUAL CHARACTERISTICS OF PHYSICIANS

This, then, describes the over-all course of the acceptance of gammanym in these four communities, from the time it first arrived on the drugstore shelves

*The prescription data were 3-day samples at intervals averaging 28½ days, which are here termed "months," so that the 16-month survey period contains 17 such "months." Because of the nature of time sampling, the introduction dates recorded here may be somewhat later than the physicians' actual introduction of the drug.

to the time when it appeared on prescription slips of most of the doctors in town. But what exactly happened during this period? Through what paths and processes did the new drug find its way into the prescribing habits of the local physician? As one essential step in answering these questions, it is necessary to examine and compare the doctors who introduced the new drug quickly with those who prescribed it only after most of their colleagues had done so. By ascertaining the backgrounds, types of practice, and other characteristics of these doctors, we can begin to sketch a picture of the "innovator" among the local practicing physicians.

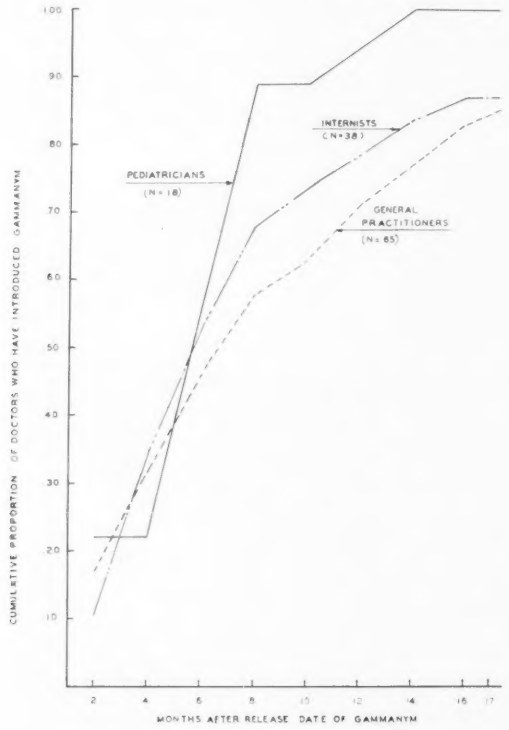

Fig. 3.—First use of gammanym by specialty.

Let us first look at specialty differences. Pediatricians introduced gammanym into their practices more quickly than internists, and internists introduced it more quickly than general practitioners, as Fig. 3 shows. The average pediatrician first prescribed the drug 6.6 months after its release, the average internist 8.2 months, and the average general practitioner 9.0 months after release. This result is somewhat surprising in view of the general impression that internists are the pace setters. But the contradiction is only apparent and results from the different prescription volume of the different specialties. The pediatricians' average number of prescriptions for alphanym, betanym, and gammanym combined was 13.6 per 3-day sampling period; for internists it was 2.7, and for general practitioners 3.6. When doctors with roughly the same volume of prescriptions

are compared, the contradiction disappears. Internists then introduce the new drug more rapidly than pediatricians or general practitioners (not shown).*

Less surprising is the finding that doctors who expose themselves frequently to the primary sources of information were much more likely to be innovators than those who do not. Figs. 4, 5, and 6 show, respectively, the more rapid rate of gammanym introduction among those who receive many journals, among those who attend many out-of-town specialty meetings, and among those who conscientiously attend conferences in their own hospitals. It is difficult to assess to what extent this is due to an actual effect of these means of communication on the doctor's prescription habits. Quite possibly it means merely that doctors who are sensitive to new developments read more and go to more meetings. What we do know is that the relationship of drug introduction to journal reading and meeting attendance is independent of the doctor's specialty. When doctors in each specialty are considered separately (not shown), the findings of Figs. 4, 5, and 6 remain essentially unchanged. In fact, reading and attendance, as shown in Figs. 4, 5, and 6, have a considerably stronger relationship to early use of gammanym than does the doctor's specialty (Fig. 3). It appears that the innovator is less characterized by his specialty than by voluntary activities like attendance at meetings and reading journals which bring him into closer contact with events in the profession.

But this is not equally true for *all* information-getting activities. There are some potential sources of influence or information, exposure to which shows no relationship to early use of gammanym. Figs. 7, 8, and 9 show that doctors who read many pharmaceutical house organs, those who attend many nonspecialty meetings (American Medical Association, state and regional medical societies, etc.) and those who attend county medical society meetings regularly were little or no quicker to introduce the drug than their colleagues who attend those media less regularly. These media apparently attract a fairly representative audience of doctors among whom sensitivity to new developments is not more prevalent than among physicians in general.

DRUG ADOPTION AND PHYSICIANS' CONTACTS WITH COLLEAGUES

The media discussed so far have been the relatively obvious channels through which innovations may be diffused to local doctors. But doctors were also found to be affected in their drug adoptions in some less obvious ways. One path which might not have been anticipated is suggested by Fig. 10, the office arrangement of the doctor. By simply dividing doctors into those who share offices with one or several colleagues and those who have an office alone, we find a considerable difference. The doctors who share offices introduced the drug an average of 2.3 months sooner than their colleagues who practice alone.

It is useful to ask just what social and psychologic processes may produce the effect shown in Fig. 10. Two hypotheses seem quite reasonable. First,

*A more detailed and comprehensive account of our research results is being prepared for publication by The Free Press under the tentative title *Doctors and New Drugs*.[1] Selected aspects are treated in detail in certain articles.[2-4]

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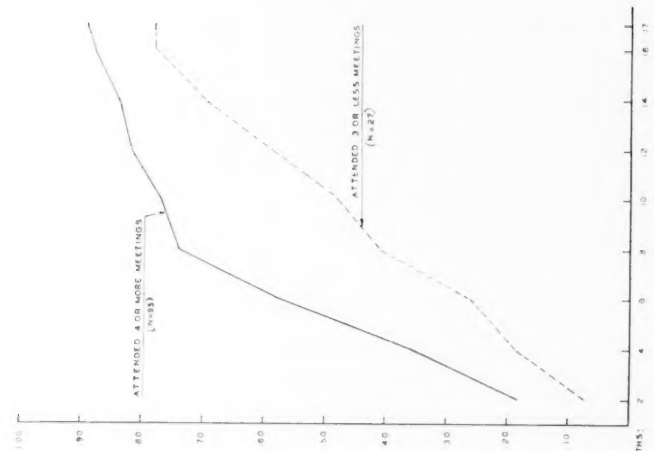

Fig. 6.

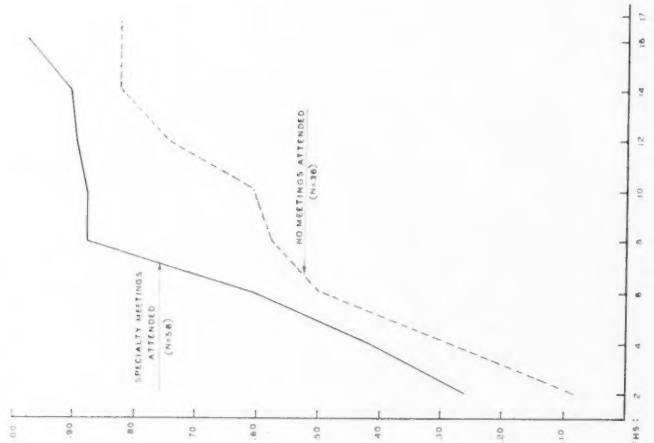

Fig. 5.

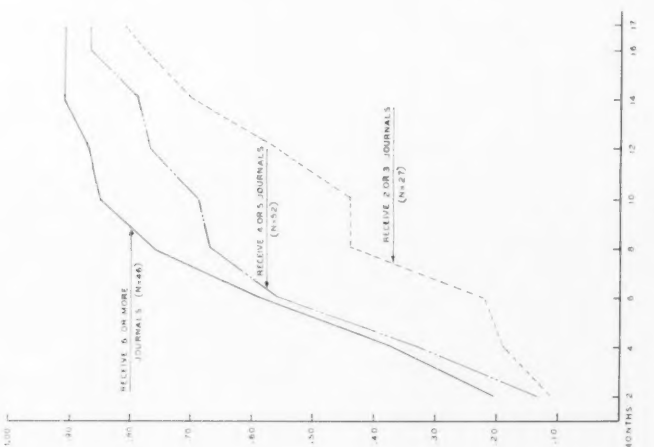

Fig. 4.

Fig. 4.—First use of gammanym by number of journals received.
Fig. 5.—First use of gammanym by specialty meetings attended.
Fig. 6.—First use of gammanym by hospital meetings attended.

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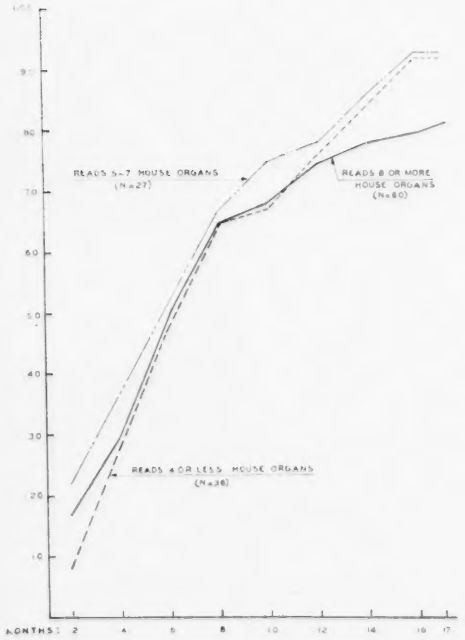
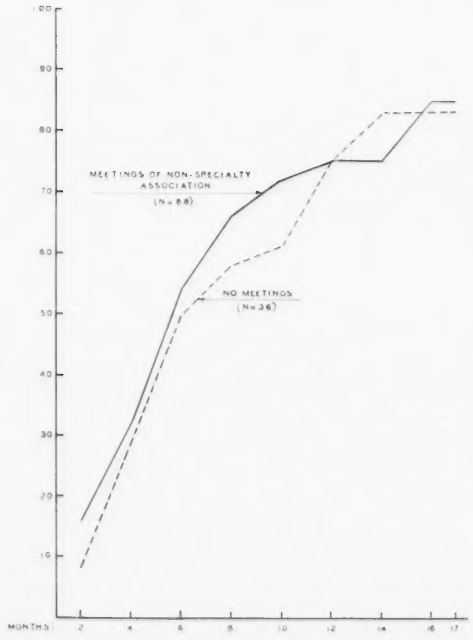


Fig. 7.



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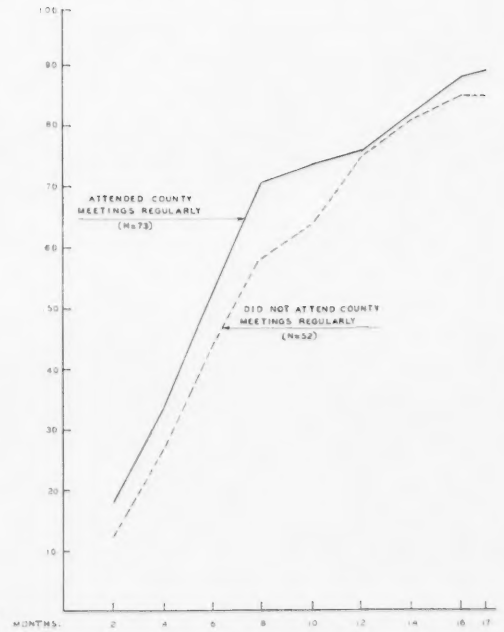

Fig. 9.

Fig. 7.—First use of gammanym by number of house organs read.
Fig. 8.—First use of gammanym by out-of-town nonspecialty meetings attended.
Fig. 9.—First use of gammanym by attendance at county medical society meetings.

being in close professional contact with colleagues keeps a doctor well informed, so that he is saved the difficulty of finding out for himself about each new development. He has surrogates to carry part of the burden of finding out about new developments, for, as soon as any of his office partners seriously consider trying a new therapy or even just finding out about a new development, they will discuss it with him.

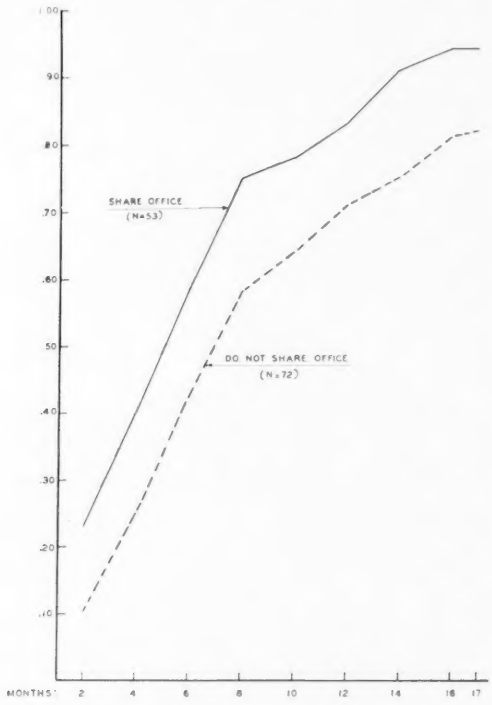

Fig. 10.—First use of gammanym by office sharing.

A second interpretation of the results, however, seems equally reasonable. Introducing a new technique into his practice is always somewhat dangerous for the physician. He has no first-hand knowledge of possible ill effects, yet he must shoulder the blame if ill effects should occur. Because of this, the doctor needs all the reassurance he can get from his fellows to lessen the uncertainty which he faces. The doctor who shares an office with others can, in a sense, depend upon their support and use it for reassurance, while the doctor who practices alone must make the bold step without this added support. It is difficult to determine which of these two interpretations is most valid without knowing whether the primary barrier to drug innovation among doctors who are alone is lack of information or lack of assurance.

But for whatever reason office-sharing leads to earlier use of new drugs, it is apparent that a doctor's social location in the community of his local colleagues affects his drug use by giving him access to information, by providing

him with assurance, or in some other way. This leads to a more general question. What about the dozens of other relations that a doctor may have with his colleagues, beside that of office partnership? What, for example, might be the importance of his contact with colleagues in the hospital during leisure hours? Would it affect his use of new practices and products? In order to answer questions like these, one must know the relations among the doctors of the community, that is, one must know the social structure of the medical community which these relations make up. To uncover the most important facets of this structure, three questions were asked of each doctor in the interview: (1) "When you need information or *advice* about questions of therapy, where do you usually turn?" (2) "Who are the three or four physicians with whom you most often find yourself *discussing cases* or therapy in the course of an ordinary week—last week, for instance?" (3) "Would you tell me who are your three *friends* whom you see most often socially?" In answer to each of these questions, three names of other doctors were requested. The replies to the three questions yielded three cross-sections of the structure of the medical communities, much like a biologist's sections of a plant fiber along several axes. Fig. 11 presents, as an illustration,

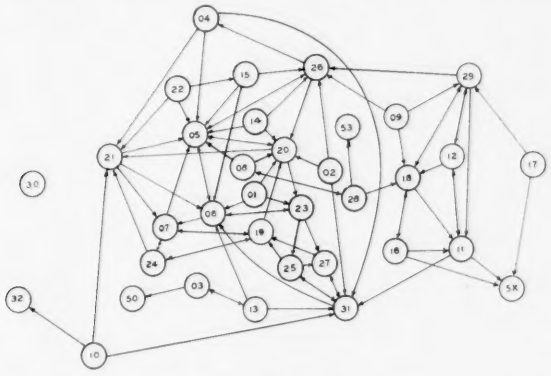

Fig. 11.—Discussion network in City D.

one of these cross-sections for one of the four cities covered in the survey. This particular diagram pictures that city's structure of discussion partnerships, that is, a sectioning according to the replies to the second question above. In this sociogram, as such a diagram is called, each circle represents a physician, who is identified by a code number. An arrow pointing from Circle 04 to Circle 05 means that Dr. 04 named Dr. 05 as one of his most frequent partners in the discussion of cases. The double-headed arrow connecting Circle 05 and Circle 06 means that Dr. 05 and Dr. 06 each named the other as a frequent partner in the discussion of cases. The fact that 7 different arrows point to Circle 31 (near bottom) means that 7 different colleagues named Dr. 31 as a frequent discussion partner; in other words, Dr. 31 is quite popular as a discussion partner.

Our general question now becomes how does this social structure of the community of physicians in a city facilitate or inhibit the diffusion of a new drug? This is an immensely complex question to answer—as complex as the social

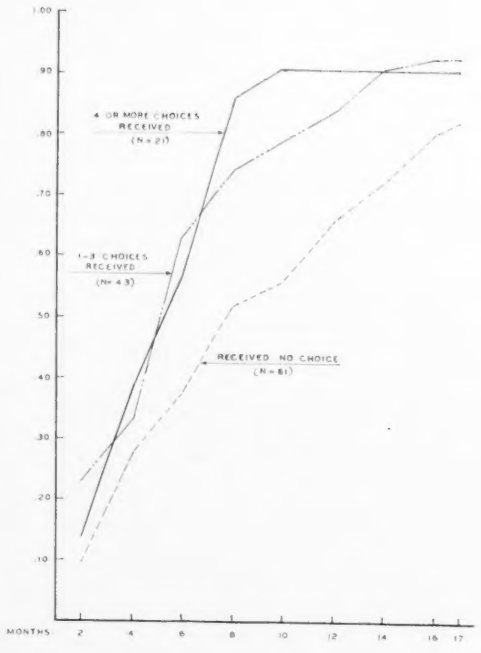

Fig. 12.

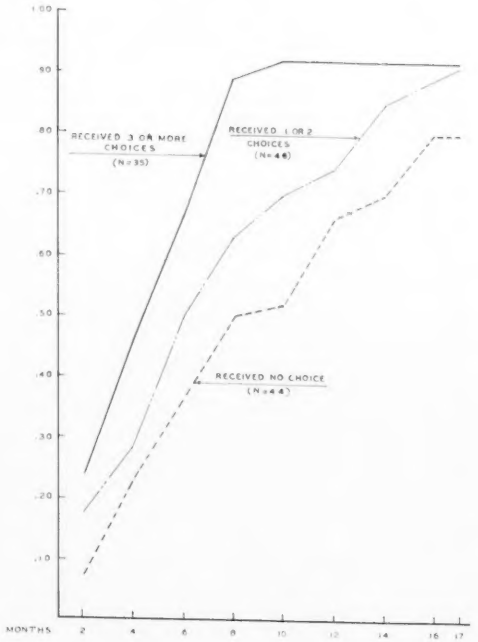

Fig. 13.

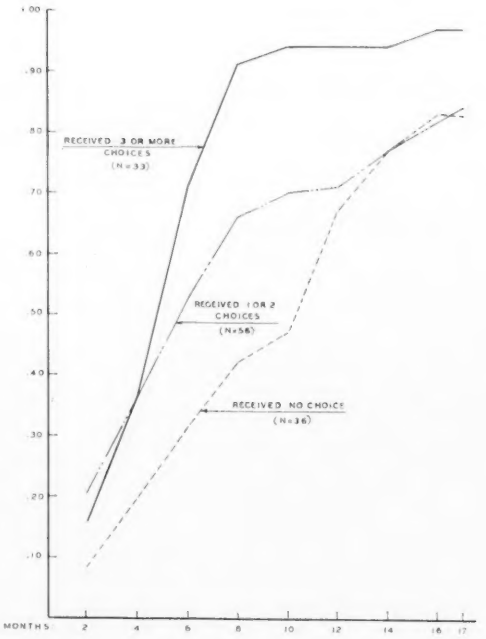

Fig. 14.

Fig. 12.—First use of gammanym by number of choices received as advisor.
Fig. 13.—First use of gammanym by number of choices received as discussion partner.
Fig. 14.—First use of gammanym by number of choices received as friend.

structures themselves. But it is possible to break the structure and the question into simpler components and to investigate them one by one. Perhaps the simplest question that can be asked in this connection is what is the difference in the rate of drug adoptions between doctors who have contact with many and with few colleagues? This question is a direct parallel to the earlier question about the difference in the rate of drug adoption between doctors who have office partners and those who have none. One can ask more specifically what is the difference in the rate of drug adoptions between doctors who are named as advisors (or as discussion partners, or as friends) by many of their colleagues and those who are not named by any? One may call the first group socially integrated, and the second group socially isolated.

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We have pointed out that doctors with office partners introduced gammanym more quickly than those who practice alone. This leads to the hypothesis that the well-integrated doctors would be quicker to introduce this new drug than their more isolated colleagues. This is indeed what is found to be true, and it is true for each of the three cross-sections of the social structure which are under examination here, as shown in Figs. 12, 13, and 14. The effect is quite strong in the predicted direction. Doctors highly integrated into each of the structures were much quicker to introduce the new drug than the more isolated doctors. The average doctor among those most frequently named as advisors introduced the new drug 3.1 months before the average of those who are never named as advisors. The corresponding mean difference between those integrated and isolated as discussion partners is 4.1 months, and between those integrated and isolated as friends is 4.3 months. The importance of these factors can be gauged from the fact that no other factor examined in the entire study yielded a mean difference of more than 4 months, with the single exception of total volume of prescriptions for this general type of medicine. These results suggest that the networks of informal relations among doctors were highly effective as chains of information and influence in the diffusion of this innovation.

Yet, one might reasonably object, is it not likely that these differences in integration and isolation merely reflect different personality characteristics among these doctors and that it is really these personality differences, and not the contacts with other doctors, which account for the striking results found? This is especially plausible in the case of the advisorship network. After all, the doctors who are often designated as advisors may very well be chosen by their colleagues precisely because they are aware of new medications. In that case their early introductions of new drugs would be a cause rather than a consequence of their high integration. Yet, contrary to this interpretation, the effect of the advisorship network is smaller, not larger, than that of the networks of discussion partners and friends. It is the friendship network which yields the largest difference (4.3 months) between the average adoption times of the integrated and isolated doctors. Since an "integrated" doctor here means one named by many colleagues as a "friend . . . seen most often socially," it is very unlikely that his integration is a result of some professional habit which is accompanied by early introduction of new drugs. It is much more likely that early introduction of the new drug was conditioned by the doctors' informal

contacts with one another, through the network of friendships, and through the more strictly professional relationships as well.

TWO PROCESSES OF DIFFUSION

But even stronger evidence for this claim can be found in another place. If the socially integrated doctors tended to introduce the drug early merely because of some personality characteristic, the use of the new drug should have spread among these integrated doctors in very much the same way as among the isolates, except earlier. If, on the other hand, it is true that the socially integrated doctors owe their early introduction of gammanym to the networks of contacts which surround them, then the use of the new drug should not only

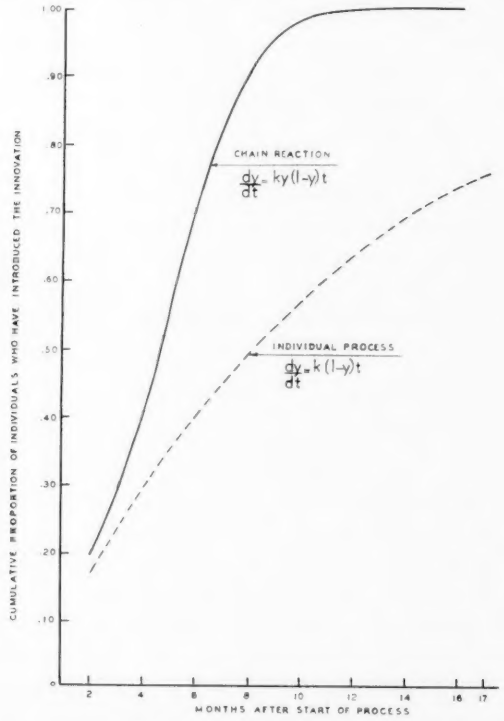

Fig. 15.—Comparison of a model of chain-reaction innovation with a model of individual innovation.

spread *earlier* among them than among the isolates, but the very *nature of the process* of diffusion should then be different. At the extremes, there would be these two processes of diffusion: (a) Among the isolated doctors, it would be an individual process. The effective stimuli—such as detail men, medical journals, advertising from drug houses, and so on—remain fairly constant throughout the diffusion period. The number of doctors introducing the new drug each month would remain a constant percentage of those who have not already adopted the drug. A typical graph for this process would look like the lower curve of

Fig. 15. (b) Among the integrated doctors, it would be an interpersonal or "snowball" process. If, for example, one pioneer introduces the new drug and converts a colleague to it during the first month, then these two doctors will convert two others during the second month; during the third month, there would be four doctors making new converts; and so on. The number of doctors introducing the new drug each month would not remain a constant percentage of those yet to be converted, but would gain headway in proportion to those who have already been converted. A typical graph for this process would look like the upper curve in Fig. 15.*

Note that the two *theoretical* curves in Fig. 15 differ not only in average height, but also in shape. The curves start out with the same proportion of initial users and then diverge sharply. The curve for the interpersonal process turns upward or "snowballs" in response to the proportion who already use the drug. The curve for the individual process bends gradually downward, indicative of response to constant stimuli. This difference in shape corresponds closely to the differences between the *empirical* curves for the extreme groups in each of Figs. 12, 13, and 14. In each instance, the curves start out with roughly the same proportion of users in the first 2 months and then diverge sharply. The curves for the integrated doctors continue steeply upward, indicating at least in part a person-to-person process. The curves for the isolated doctors bend gradually downward, as would be expected in the case of an individual diffusion process. To be sure, none of these empirical curves fit exactly the extremes shown in Fig. 15.†

Figs. 12, 13, and 14, which showed the relationship of adoption rates to the doctor's contacts with his colleagues, can now be contrasted with Figs. 3-6, which showed the relationship of adoption rates to a series of individual characteristics (specialty, number of journals read, and so on). The upper and lower curves in each of Figs. 3-6 often diverged sharply from the beginning, and the upper curves had essentially the same shape as the lower curves. This is as expected, if the doctors represented by these upper and lower curves differ in individual receptivity to or awareness of innovations, but not in their location in effective networks of interpersonal relations.‡ While these results constitute only a case study of the diffusion of one new product among the doctors of four cities, they have important implications. They suggest that a doctor's tendency to innovate is not only a function of something about him as an individual, but also—and

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*This process, well known in the study of rates of reaction in chemistry and in population studies, is known as the logistic law. It has been spoken of as the "Law of Social Change," e.g., Ridenour.[5]

†A detailed examination of the correspondences and contrasts will be undertaken.[1] More concise numerical documentation of the finding is reported elsewhere.[3]

‡It is worth noting that office partnership (Fig. 10), a "social" attribute, shows generally the same shape as the "individual" variables of Figs. 3 - 6. Office partnership, however, constitutes a different kind of social configuration than do the networks represented in Figs. 12-14. A doctor who shares an office with another is in contact with *that* other doctor and not part of an interlocking network. Thus while he may benefit from his partner's sensitivity to the new drug and thus come to adopt it earlier, he is not a part of a chain reaction or "snowballing" system by virtue of this partnership.

more strongly—a function of his social location among other doctors. The social and professional contacts a doctor has with his colleagues evidently serve important functions in the diffusion of a new practice, which are not duplicated by journals, meetings, detail men, or drug house advertisements.

But this result leaves much unsaid. What is it about the social networks that affects the innovating behavior of men within them? Is it merely transmission of information, or do these networks provide the doctor in an unclear situation with the security of numbers? And what are the various stages of the diffusion process as the new drug changes from one used by a small minority into one used by almost the whole community? These are the questions to be considered now.

THE QUESTION OF SIMULTANEOUS ADOPTIONS BY DOCTORS WHO ASSOCIATE WITH EACH OTHER

How can some of these more complex questions about the stages of diffusion be examined? One way, though certainly not the only way, is to examine pairs of doctors who maintain some specified form of contact with one another. Each doctor, it will be recalled, had been asked three questions about his relations to his colleagues. (To whom did he turn for *advice?* With whom did he most often *discuss cases?* What *friends* did he see most often socially?) A doctor and any colleague whom he named in reply to any of these questions constitute a pair of related doctors.

If the networks of doctor-to-doctor contacts are effective, then pairs of related doctors should be more alike in their behavior than pairs assorted at random. More specifically, if a chain-reaction process of drug introduction is at work, then, it seems, adjacent links in the chain—that is, pairs of related doctors—should introduce the drug at about the same time, ideally, during the very same months. If, on the other hand, the use of gammanym was not transmitted through these networks, then the interval between the gammanym adoption dates of doctors and their advisors, doctors and their discussion partners, and doctors and their friends would be no shorter than those of any two doctors picked at random.

Actually, the average intervals between the dates of gammanym adoption of each doctor and those whom he had named as his advisors, discussion partners, or friends was almost identical to the average intervals for pairs picked at random.* This meant the rejection of our original hypothesis that pairs of doctors in contact would introduce the drug more nearly simultaneously than pairs of doctors assorted at random. There was, on the other hand, the earlier evidence that the doctor's integration was important to his introduction of gammanym. This dictated a more intensive look at the behavior of pairs of doctors. Accordingly, we raised the question whether the networks, though ineffective for the *whole* period studied, may have been effective for the *early* period, immediately after the drug was marketed. This, indeed, proved to be the case.

*The "random" formula used makes allowance for the earlier gammanym adoption of the more integrated doctors. For details on the statistical procedures, see, Coleman, Katz, and Menzel.[3]

THE STAGES OF SOCIAL DIFFUSION

In order to describe this tendency more precisely, an *index of simultaneity* has been devised, constructed separately for each month. As applied here, it measures how closely the drug introduction of doctors during a given month followed the introductions by any associates who had adopted the drug during the same month or earlier. This index would have a value of +1 if each doctor had introduced the drug during the same month as his discussion partner (or friend, or advisor); it would be zero if the introduction dates of the two doctors in a pair were as far apart as expected by chance.* In Fig. 16, the values of this index are plotted. Separate curves are plotted for pairs of friends, pairs of discussion partners, and advisor-advisee pairs. Comparing the three structures, it appears that the discussion network and the advisor network are much alike in their effects. Both are most effective during the earliest period. Both are somewhat more effective than the friendship network during these early periods. The friendship network, on the other hand, appears to have its maximum effectiveness later, about 5 months after gammanym appeared on the market. Finally, after about 6 months, none of the networks any longer show an effect.

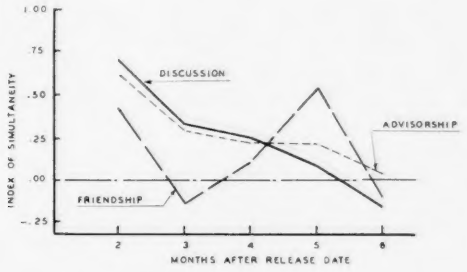

Fig. 16.—Index of pair-simultaneity for three networks at different times.

These findings, which show different effectiveness of the social networks at different times after the drug's release, have several implications which will be examined shortly. But first, the very structure of the networks has its own implication. Whatever effect these networks have should operate first in the more dense parts of the structure, where a number of lines of social relationship converge and should only then spread out to the more open parts of the structure, that is, to the relatively isolated doctors. It has already been shown that the more isolated doctors, on the average, introduced gammanym considerably later than the socially more integrated doctors. We propose, however, that when more isolated doctors did introduce the drug early, it was not with the

*The index automatically compares the actual closeness to a random model and also makes allowance for the fact that, for example, adopters during the first month could not possibly follow anyone by more than one month, while later adopters could. For further discussion of the index and the statistical methods used, see Coleman, Katz, and Menzel.[1-3]

help of the social networks. While the networks were operative as channels of influence early for the integrated doctors, they were operative only later for the more isolated ones. This is what seems to have occurred. Fig. 17 plots the index of simultaneity separately for more and less integrated doctors. (The graphs show weighted averages for all three networks; separately the numbers of cases would be so small as to produce erratic trends.)

The peak of effectiveness of doctor-to-doctor contacts for the well-integrated doctors appeared in the earliest month for which it can be plotted (the second month) after which effectiveness sharply declined. For the relatively isolated doctors, by contrast, the networks were not so effective at first as were those for the integrated doctors, but they maintained their effectiveness longer. Thus it appears that the networks of relations were effective not only for the more integrated doctors but also for those relatively isolated doctors who introduced the drug during the first 5 months of the drug's availability.

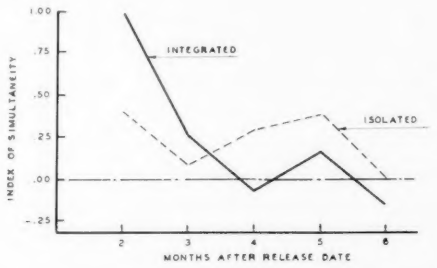

Fig. 17.—Index of pair-simultaneity at different times for doctors differing in integration.

To summarize the results so far, it appears that social influence in the process of drug adoption occurred in several stages. First, it operated only among the doctors who are most integrated into the community of their colleagues through ties of a professional nature (as advisors or as discussion partners). Then it spread through the friendship network to doctors who are closely tied to the medical community through their friendship relations. By this time, social influence had also become operative in the more diffuse parts of the social structure, that is, among the relatively isolated doctors. Finally, there came a phase during which an occasional doctor still introduced gammanym, but in complete independence of the time at which his associates introduced it; the networks now showed *no* effect. For the integrated doctors, this phase began 4 or 5 months after the drug's release. For the isolated doctors, it began about 6 months after the drug's release. By this time, the social structure seems to have exhausted its effect. Doctors who introduced gammanym into their practices after this time apparently responded exclusively to influences outside the social networks, such as the professional journals, detail men, drug house advertisements, and so on. They did not, it appears, depend upon their personal relations with other doctors for information and influence. The channels of influence between doctors had operated most powerfully during the first few months after the release of the new drug. Such influence as any doctor had upon his immediate

associates by his introduction of the drug occurred very soon after the drug became available. Why is this?

THE ROLE OF CONTACTS WITH COLLEAGUES IN CLEAR-CUT AND AMBIGUOUS SITUATIONS

One answer is that it is only in the early months after a drug's appearance that a doctor needs the support and judgment of his colleagues. It is chiefly when the drug is new that the doctor who is to adopt it needs his colleagues to confirm his judgment and to share the feeling of responsibility in case the decision to adopt the drug should be wrong. At this time, familiarity with the new drug is minimal and the doctor is in an uncertain situation. Several sociopsychologic experiments have shown that it is precisely in situations which are objectively unclear, situations in which the individual's own senses and other objective resources cannot tell him what is right and what is wrong, that he needs and uses social validation of his judgments most fully.[6] The first months following the release of a new drug appear to present just this kind of situation. To be sure, the particular drug innovation with which this research has dealt was not a dramatic one. Presumably the effects shown here would be much stronger in the case of a more radical innovation. It is nevertheless suggested that the reason for the greater effectiveness of contacts with gammanym users during the earliest months after the release of the drug was due to the greater uncertainty about the drug that prevailed at that time. It is proposed that a doctor will be influenced more by what his colleagues say and do in uncertain situations than in clear-cut situations.

This hypothesis also implies that the necessity for support and validation of judgments by colleagues would be much greater in decisions about some medical conditions than about others. It would be great where the physiology of the illness is not well understood and the treatment is subject to much trial and error. It would be small in conditions which are well understood and in which the action of the medication is well known. It is possible, in fact, to test this implication with certain data of this study. This time the data do not refer to the time of introduction of a new drug, but rather to the habitual use or nonuse of certain classes of modern drugs for two specified conditions. These were respiratory infections and mild-to-moderate cases of essential hypertension. Respiratory infections allow few alternatives of treatment, and their success or failure becomes quickly apparent. They present a clear-cut situation. Hypertension, on the other hand, allows many kinds of treatment and their success can be gauged only slowly and with difficulty. Hypertension presents an uncertain situation.

The implication of the general hypothesis is therefore that pairs of related doctors should be more alike (compared to chance expectations) in their treatment of hypertension than in their treatment of respiratory infections. In order to test this hypothesis, the doctors were classified first according to whether or not they named a broad-spectrum antibiotic as "the antibiotic or sulfonamide [they] most commonly used in infectious conditions of the respiratory tract." They were also classified according to whether or not they included Rauwolfia

serpentina drugs in their "usual treatment for essential hypertension in mild or moderate cases." Finally, the Rauwolfia users were divided according to whether they preferred reserpine or other Rauwolfia preparations. With respect to the first classification, a doctor and his friend were considered alike if both or neither named a broad-spectrum drug; with respect to the second, doctors were considered alike if both or neither included Rauwolfia drugs; and, with respect to the third, they were considered alike if both or neither preferred reserpine to other Rauwolfia drugs.

Table I gives the results in terms of an index of homogeneity. This index would be +1 if all pairs were alike; it would be zero if pairs of related doctors were no more often alike than expected by chance; and it is negative if pairs of related doctors are less often alike than expected by chance. The results confirm the hypothesis: in all three networks, pairs are homogeneous beyond chance expectations in hypertension treatment but hardly at all in the treatment of respiratory infections. This finding, like that of the simultaneity of gammanym adoptions by pairs of doctors in the early months, presumably arises from the need for social support and social validation in situations where authoritative objective validation is scant.

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TABLE I. HOMOGENEITY OF PAIRS OF RELATED DOCTORS IN TREATMENT OF RESPIRATORY INFECTIONS AND HYPERTENSION*

	ADVISOR-ADVISEE PAIRS	DISCUSSION PAIRS	FRIENDSHIP PAIRS
Respiratory infections (broad-spectrum vs. other antibiotics)	−0.056	−0.016	0.029
Hypertension (Rauwolfia included or not)	0.054	0.095	0.109
Hypertension (reserpine vs. nonreserpine)	0.280	0.410	0.233
N (number of pairs)	(253)	(258)	(211)
	(165)	(151)	(121)
	(111)	(97)	(71)

*These data refer to all 216 interviewed physicians, not only to the 125 whose prescription record was examined. Cf. footnote, p. 2.

SUMMARY

Two hundred and sixteen physicians in four cities were interviewed, and the prescription records of 125 general practitioners, internists, and pediatricians among them were searched, in order to study how the use of a new drug termed "gammanym" spread through these communities of physicians. The main findings are:

1. Gammanym was introduced earlier by doctors with a large volume of prescriptions for this general type of drug, by those who exposed themselves frequently to certain media of information, and by those who shared their offices with one or several partners.

2. Doctors who maintained a variety of contacts with a large number of colleagues, the socially integrated doctors, typically introduced the new drug into their practices months before their relatively isolated colleagues. The degree of a doctor's integration was measured by the number of his colleagues who named him, in response to certain interview questions, as an advisor, frequent discussion partner, or frequently visited friend.

3. Among the integrated doctors, the use of the new drug spread at an accelerating rate, indicating an interpersonal process of diffusion, while among the isolated doctors use of the new drug spread at a constant rate, indicating largely individual responses to constant stimuli outside the community of doctors.

4. The hypothesis that a doctor and his friend, a doctor and his advisor, and a doctor and his discussion partner would tend to introduce the new drug at about the same time was not borne out for the period as a whole.

5. During the early months following the drug's release, however, doctors who introduced the drug tended to follow closely upon any associates who had adopted it earlier.

6. This phenomenon was strongest during the very earliest months in the case of pairs of discussion partners and advisor-advisee pairs. In the case of pairs of friends, it reached its peak about 2 months later. In all three cases, the phenomenon occurred among the relatively isolated doctors as well as among the integrated doctors, but it reached its peak much later in the case of the isolated doctors.

7. The apparent greater effectiveness of contacts with colleagues during the early months was attributed to the greater uncertainty about the new drug that prevailed at that time. This interpretation is supported by comparisons of uncertain and clear-cut situations of another sort; pairs of related doctors were found to be more alike in the drugs they use for essential hypertension than in the drugs they use for respiratory infections.

A second article will inquire into the possible relationship of early gammanym introduction by a doctor to a more general tendency to be receptive to innovations.

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DIMENSIONS OF BEING "MODERN" IN MEDICAL PRACTICE

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IN ORDER to learn something of the way in which medical innovations make their way into the doctor's practice, intensive interviews were conducted with 216 physicians in four midwestern cities, and their replies were subjected to statistical analysis. A previous article[1] described how the use of a new medication spread gradually among most of the 125 general practitioners, pediatricians, and internists among them. (This was ascertained by examining pharmacists' prescription records covering a 16-month period.†) This account constitutes a case history of the diffusion of a single innovation, a relatively minor variant of a well-established family of drugs. One cannot presume that the findings presented so far would necessarily hold true for innovations of other kinds or under other conditions. One wonders, nevertheless, whether the doctors who were first to use this particular drug would again be first the next time a new drug is introduced and whether they are progressive in other respects as well. This is an intriguing question; for, on the one hand most doctors know that they evaluate each proposed innovation on its own merits and, on the other hand, one keeps hearing some doctors described as "quick to jump on the bandwagon," or as "individuals that try everything that comes along," while others are characterized as "stodgy doctors" who "are not interested in hearing about new techniques and want things to go on as they are." Are such descriptions mere caricatures, or is there really some generalized tendency or trait of "innovatingness" which is strong in some doctors and weak or absent in others? This article is designed to answer this question, to the extent that an answer is possible on the basis of the data gathered. We will first look into the timing of the introduction of new drugs into the individual physician's practice and then into other aspects of the use of modern drugs. Later we will turn to some broader questions of modern practice.

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*Coleman and Katz have transferred to the Department of Sociology, University of Chicago, since this study was conducted.

†A fuller account of our findings and procedures is being prepared for publication by The Free Press under the tentative title *Doctors and New Drugs*.[2] Selected aspects are treated in detail in certain articles.[3-5]

THE TIMING OF THE FIRST USE OF THREE NEW DRUGS

The basic datum in our previous article was the date on which each doctor prescribed a certain medicine, termed "gammanym" in our report, for the first time. It was seen that 87 per cent of the doctors had used gammanym at least once, but that the dates on which they prescribed it for the first time ranged over the survey's entire period of 16 months from the time gammanym was released. Is a doctor's early introduction of gammanym attributable to any readiness to accept innovations generally? This question cannot be answered on the basis of experience with only one new drug. Fortunately, we have information on the doctor's introduction of two additional classes of drugs. One of these is a group of products which were first released on the American market about 6 months before "gammanym." Like gammanym, these drugs had possible application in the practice of most physicians; they will here be referred to by the name "cryptonym." Actually, all but 5 per cent of the interviewed physicians who treated the relevant conditions at all had used cryptonym drugs by the time they were interviewed. Again the time at which they had started using the new products varied widely. Were the early cryptonym users to be found among the early gammanym users, or was there no connection between these two forms of innovation? Table I shows that the early cryptonym users were indeed very likely (68 per cent) to be early gammanym users, while most (93 per cent) of the late cryptonym users were also late gammanym users. However, Table I is based on the relatively small number of doctors in the sample who used both drugs and gave precise information on the time they first used them.

TABLE I. TIMING OF FIRST USE OF TWO NEW DRUGS*

INTRODUCED GAMMANYM	INTRODUCED CRYPTONYM	
	BY THE FIFTH MONTH	AFTER THE FIFTH MONTH
Before the fifth month	68%	7%
During the fifth month or later	32	93
	100% (22)	100% (14)

*Tabulates only doctors who gave precise information about the timing of their introduction of both these drugs. Other doctors either did not use both drugs or else gave imprecise answers like "when it first came out." The doctors' own statements rather than pharmacists' records were used for this and the following table. This procedure will be discussed presently.

In order to conceal the identity of commercial products, all calendar dates are translated into "months after the release of gammanym."

A third group of drugs on which information was collected was not the same for each doctor. Each doctor had been asked, "What is the name of the drug that you have most recently tried in your practice? When did you use it for the first time?" The release date of each drug mentioned was ascertained and

the gap in time between that release date and the date on which the doctor first used the drug was measured. As before, this gap was found to vary over a wide range. Some doctors had "most recently tried" a drug which had only just been released; others, a drug that had been available for 18 months or more. Again the question arises are the doctors who were prompt in trying this self-designated drug to be found chiefly among doctors who were prompt to try gammanym and cryptonym? Table II provides the answer. Quite clearly, prompt introduction of the self-designated drug occurred most commonly (32 per cent) among the prompt introducers of gammanym and cryptonym. Later introduction of the self-designated drug occurred most commonly (76 per cent) among the slower introducers of gammanym and cryptonym. This finding gives us considerable confidence in the existence, within each doctor, of an over-all tendency to try out new drugs early or late.

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TABLE II. TIMING OF FIRST USE OF THREE NEW DRUGS

INTRODUCTION OF SELF-DESIGNATED DRUG	INTRODUCTION OF GAMMANYM AND/OR CRYPTONYM (COMBINED)*		
	MOST PROMPT	INTERMEDIATE	LEAST PROMPT
Within 1 month of release	32%	13%	5%
2 to 4 months after release	18	44	19
Over 4 months after release	50	44	76
	100% (34)	100% (39)	100% (37)

*Table II lists all doctors who gave precise information about the timing of their introduction of a self-designated drug and of at least one of the two drugs, gammanym or cryptonym. If they gave information on both, the average date was used.

THE DOCTOR'S OWN TESTIMONY AND HIS PRESCRIPTION RECORD

The tabulations in our earlier article were based on prescription records kept by pharmacists. Because pharmacists' prescription files were examined only for one type of drug, we are relying here on the doctors' own testimony. But is the physician's memory about the time when he first used a new drug reliable? Table III provides a partial answer.

There is evidently a fairly strong correlation between the date of first use of gammanym as stated by the doctor and that revealed by a search of the pharmacists' files. The doctors are certainly not guessing or making the dates up. Doctors who placed themselves in the class of earliest introducers tend to be found in the earliest class according to the prescription search. Those who placed themselves in the latest class tend to be found in the latest class according to the record. Those who indicated an intermediate position for themselves tend to occupy an intermediate position according to the files. In other words, the doctor's own statements produce for most, though not all, doctors the same ordering as does the search of prescription records.

TABLE III. DATE OF INTRODUCTION OF GAMMANYM
(Interview and Prescription Data Compared*)

PRESCRIPTION RECORD	DOCTOR'S OWN STATEMENT			
	BEFORE 3RD MONTH, OR "WHEN IT CAME OUT"	3RD TO 6TH MONTH	7TH TO 10TH MONTH	11TH TO 14TH MONTH
Before 5th month	46%	43%	29%	20%
5th to 8th month	32	29	50	20
9th to 12th month	5	10	7	20
After 12th month or never	18	19	14	40
	100% (22)	100% (21)	100% (14)	100% (10)

*The classification used in Table III allows the doctor's statement a 2-month "headstart," for reasons which will soon become apparent. Calendar dates are replaced by "months after the release of gammanym," as before.

This, to be sure, is far from saying that the actual date given by the doctor is the same date as that revealed by the prescription search. In fact, even if we allow both to the doctor's statement and to the sampling of the pharmacists' files a modest margin of error, only about one-quarter of the doctors can qualify as accurate (defined as stating a date not more than one month before or after the prescription date).

TABLE IV. DATE OF INTRODUCTION OF GAMMANYM
(Interval between Interview and Prescription Dates)

INTERVIEW DATE	PER CENT OF DOCTORS
Follows prescription date by 2 months or more	24%
Falls within one month's distance from prescription date	27
Precedes prescription date by 2 to 7 months	25
Precedes prescription date by more than 7 months	24
	100% (70)

Table IV shows that 27 per cent of the doctors on whom sufficient information is available fall within this somewhat liberalized definition of accuracy. At the same time, the number of doctors who give an earlier date than their prescription record is exactly twice that of the doctors who give a later date. This indicates that the majority of these doctors prefer to think of themselves as prompt triers of a new drug, rather than as latecomers. Hence, in instances where their memory fails to give them an accurate date, they tend, unconsciously or consciously, more often to "update" than to "downdate" themselves.*

*To some extent this discrepancy is also due to the fact that the prescription search only sampled 3 days of every month and therefore yielded dates which may frequently lag a month or so behind the actual introduction date. But this sampling error can account for only a fraction of the observed discrepancy.[5]

This, incidentally, is not the only indication of the fact that the majority of these doctors feel it better to appear modern in their drug use than to appear conservative. Gammanym had two older competitors, drugs of the same general type, that had been released some years earlier. We shall call them "alphanym" and "betanym" in the order of their appearance. Doctors were asked which drug of this type they currently used most frequently, and their answers were compared with the drug that appeared most frequently in their recent prescription record.

The largest percentage in each column of Table V is not located at the diagonal, where the two readings correspond, but below the diagonal. That is to say, there is a strong tendency to update one's prescription habits (at least with respect to this family of drugs) and to update to the very newest thing.

TABLE V. CURRENTLY PREFERRED DRUG
(Prescription Versus Interview Data)

INTERVIEW DATA	PRESCRIPTION DATA		
	ALPHANYM	BETANYM	GAMMANYM
Alphanym	33%	8%	4%
Betanym	25	32	18
Gammanym	42	60	78
	100% (24)	100% (25)	100% (49)

The interview statements, in brief, would seem to yield a correct ordering of most (though not all) of the doctors according to the promptness of their use of gammanym but not to reproduce the precise dates. In view of this fact, does the earlier finding (Table II) really mean that each doctor has some over-all tendency to try new drugs early or late or does it merely prove that those who exaggerated, in their memory, their promptness with one drug will exaggerate their promptness with other drugs? If the association between the stated introduction dates of three drugs is merely a result of the doctor's varying tendencies to exaggerate their promptness, then the doctors who exaggerate most (in either direction) should show the association most, and the doctors who give accurate accounts should not show it at all. Table VI therefore divides the sample of doctors according to the degree of accuracy of their stated gammanym introduction dates (Table IV) and records for each resulting group separately the degree to which the reported introduction dates of three drugs go together.

Table VI shows clearly that the tendency to show equal promptness with regard to the introduction of several drugs is at least as high among the more accurately reporting segment of the doctors as among the whole group. In fact, it is the less accurately reporting segment which shows the lower association. Since distortion in the interview does not raise the apparent tendency to equal promptness with regard to the several drugs, it may be concluded that this tendency is not merely apparent but real. (Finer breakdowns as to accuracy than those used in Table VI give completely parallel results but are not shown because

of the small frequencies involved.) These doctors do indeed differ from each other in a generalized tendency to adopt each new drug early or late after its release, a tendency which expresses itself anew each time a new drug appears.

TABLE VI. TIMING OF FIRST USE OF THREE NEW DRUGS SHOWN SEPARATELY FOR DOCTORS GIVING MORE AND LESS ACCURATE ACCOUNTS OF THEIR INTRODUCTION DATE OF GAMMANYM

DOCTORS INCLUDED	INTRODUCTION OF SELF-DESIGNATED DRUG	INTRODUCTION OF GAMMANYM AND/OR CRYPTONYM (COMBINED)*		
		MOST PROMPT	INTER-MEDIATE	LEAST PROMPT
1. All doctors on whom sufficient information exists†	Within 1 month of release	33%	17%	0%
	2 to 4 months after release	24	50	29
	Over 4 months after release	43	33	71
		100% (21)	100% (18)	100% (17)
2. The more accurately reporting segment	Within 1 month of release	40%	22%	0%
	2 to 4 months after release	33	56	17
	Over 4 months after release	27	22	83
		100% (15)	100% (9)	100% (6)
3. The less accurately reporting segment	Within 1 month of release	17%	11%	0%
	2 to 4 months after release	0	44	36
	Over 4 months after release	83	44	64
		100% (6)	100% (9)	100% (11)

*See footnote to Table II.

†The figures for this group differ slightly from those in Table II because here only those doctors are considered on whom prescription as well as interview data on gammanym are available.

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THE EXTENT OF USE OF NEW DRUGS

The discussion so far has revolved around the question, "How soon after its release will a doctor introduce a new drug into his practice?" We now turn to the question, "How extensively will the doctor use a new drug, once it has become established?" This is a rather complex topic. It was necessary to concentrate on some one family of drugs, so that the doctors could be questioned about its use in considerable detail. Antibiotics, applicable in a wide variety of situations, were selected. The first question to be considered here is, "For what range of indications does the doctor use the newer drugs?" Doctors were asked what antibiotic or sulfonamide they most commonly used for gastrointestinal, genitourinary, and respiratory tract infections. Many doctors preferred penicillin or sulfa drugs for all three of these types of infections; a few preferred the newer drugs (broad-spectrum antibiotics and special antibiotics like bacitracin, neomycin, polymyxin, etc.) for all 3 infections; still others preferred penicillin and sulfa drugs for some of these infections, and the newer drugs for others (Table VII).

TABLE VII. PREFERENCE FOR NEWER ANTIBIOTICS OVER PENICILLIN OR SULFONAMIDES IN THREE INFECTIOUS CONDITIONS

NEWER ANTIBIOTICS PREFERRED IN	PER CENT OF DOCTORS
All three conditions	9%
Two conditions	31
One condition	26
None of the three	34
	100% (144)

A second meaning of the question, "How widely does the doctor use the newer drugs," is "How early in the course of the diagnosis of a given case is the decision to use the newer drugs reached?" This question is, of course, especially relevant in the case of antibiotics. Doctors answered detailed questions about their treatment of "pneumonia," broadly defined as suspected cases of any kind of pneumonia or pneumonitis. The largest group of doctors indicated that they treated such cases initially with penicillin and had recourse to one of the broad-spectrum drugs when penicillin failed. Another group administered the broad-spectrum drugs initially, either with or without penicillin. A third group indicated that they prescribed broad-spectrum drugs only after laboratory or other special diagnostic procedures had satisfied them that they dealt with "virus pneumonia," and a final very small group said that they never used broad-spectrum antibiotics for cases of pneumonia (Table VIII). Are the doctors who prefer the newer antibiotics for a wide range of infectious conditions more likely than others to use them early in the course of the diagnosis of a given case? Table IX gives the answer. A fairly strong relationship between these two tendencies is seen to exist. One-quarter of those who prefer the newer antibiotics for a wide range of conditions, contrasting with only 8 per cent of those who usually prefer penicillin or sulfa drugs, administer broad-spectrum antibiotics as soon as "some kind of pneumonia" is encountered. Conversely, only 13 per cent of the former group but 33 per cent of the latter refuse to prescribe broad-spectrum drugs for pneumonia patients without a laboratory diagnosis, if then.

TABLE VIII. POINT IN DIAGNOSIS OF "PNEUMONIA" AT WHICH BROAD-SPECTRUM ANTIBIOTICS ARE USED

WHEN FACED WITH "SOME KIND OF PNEUMONIA," BROAD-SPECTRUM DRUGS ARE USED	PER CENT OF DOCTORS
Initially	16%
Whenever penicillin fails	60
Only after laboratory test	14
Not at all	10
	100% (128)

TABLE IX. RANGE OF INFECTIONS FOR WHICH NEW ANTIBIOTICS ARE PREFERRED, COMPARED WITH PROMPTNESS TO USE BROAD-SPECTRUM ANTIBIOTICS IN THE COURSE OF DIAGNOSIS OF "PNEUMONIA"

WHEN FACED WITH "SOME KIND OF PNEUMONIA," BROAD-SPECTRUM DRUGS ARE USED	AMONG DOCTORS PREFERRING NEWER ANTIBIOTICS IN THE FOLLOWING NUMBER OF INFECTIOUS CONDITIONS		
	TWO OR THREE	ONE	NONE
Initially	25%	12%	8%
Whenever penicillin fails	62	70	58
Never or only after special test	13	18	33
	100% (40)	100% (33)	100% (36)

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This bespeaks a very consistent attitude of either enthusiasm or hesitancy toward the newer antibiotics. Since this attitude is also associated with preference for the newest product among the broad-spectrum antibiotics (not shown), it may be concluded that it is, at least to a certain extent, an expression of a tendency to prefer (or mistrust, as the case may be) new therapeutic agents.

EXTENT OF USE OF NEWEST DRUGS COMPARED WITH PROMPTNESS OF DRUG INTRODUCTIONS

It remains to be seen whether a doctor's tendency to make wide use of newer drugs, discussed in the last few paragraphs, is related to the tendency to introduce new drugs quickly, which was discussed earlier. Table X therefore classifies doctors according to the average promptness with which they tried "gammanym," "cryptonym," and the "drug most recently tried" after their respective release dates. It becomes possible to see whether the doctors who were fast and slow to try new drugs differ correspondingly in the *extent* to which they make use of new drugs which have already become established.

In each of the two parts of Table X, the percentages differ from column to column, but the differences follow no consistent direction. This indicates that neither the range of conditions for which a doctor prefers the newer antibiotics nor his willingness to prescribe broad-spectrum antibiotics at various points in the diagnosis of "pneumonia" are systematically related to the promptness with which he tries new drugs. Thus it appears that the *extent* to which the newer drugs are used by preference to their older equivalents is not systematically related to the *promptness* with which a doctor tries a newly available drug. (It should be remembered that "extent of use," as used here, is not the same as prescription volume but means, rather, the number of different situations in which the new drug is used or the frequency with which it is used *relative* to its competitors.)

All the evidence considered up to this point referred to the use of new drugs—in fact, only to selected classes of new drugs. As far as this evidence goes, however, it is concluded that a doctor's early or late adoption of the particular new

TABLE X. TIMING OF FIRST USE OF THREE NEW DRUGS COMPARED WITH EXTENT OF USE OF NEWER DRUGS

	AMONG DOCTORS WHO TRIED 3 NEW DRUGS		
	MOST PROMPTLY	INTER-MEDIATE	LEAST PROMPTLY
A. Newer antibiotics preferred to penicillin and sulfonamides in			
2 or 3 conditions*	38%	54%	36%
One condition	34	15	30
None of the three	28	32	34
	100% (32)	100% (41)	100% (53)
B. When faced with "some kind of pneumonia," broad-spectrum drugs are used			
Initially	18%	20%	13%
Whenever penicillin fails	67	51	63
Only after laboratory test or never	15	29	24
	100% (33)	100% (35)	100% (46)

*The three conditions considered are gastrointestinal, genitourinary, and respiratory infections.

drug that was first examined is not an isolated event but tends to be associated with certain other expressions of a positive or negative attitude toward innovations. Early users of one drug were very likely also to be early users of a second and a third drug. On the other hand, no connection could be proved between the promptness with which a physician tries newly released drugs and the extent to which he makes use of newer rather than older drugs, once the newer drugs have been in general use long enough that preferences for them have reached an equilibrium point.

But what of other innovations in medical practice besides the use of new pharmaceutical products? After all, the rapid development of new medications is only one of several ways in which contemporary medical practice is undergoing continuous change, and probably not the most important one. Are doctors who are progressive in their drug use, in any sense of the word, prone to be especially receptive to innovations of other types? We will now consider from this point of view doctors' reactions to the new doctor-patient relationship that has developed during recent decades. We will examine the possibility of rating doctors on a conservative-modern continuum by turning to their reactions to certain broader features of the practice of medicine at mid-century.

THE ROLE OF PSYCHOLOGY IN MEDICAL PRACTICE

One of the newer trends in medicine is that toward increasing attention to psychologic factors in organic ailments. In the course of these same interviews held in 4 midwestern cities, the doctors were asked the following question: "In recent years, there has been a lot of emphasis on psychosomatic medicine in the profession. Do you think there is too much emphasis on this, or not enough?"

Thirty-seven per cent replied that the current emphasis was just about right; 38 per cent thought that there was not enough emphasis on psychosomatic medicine ("I'm a great believer. Half my patients are psychosomatic. Men who disapprove are far behind the times."); 25 per cent thought it was being overemphasized ("It's the easy way out if you can't make a diagnosis. They'd better give medicine in the bottle for a while." "It might be better if we gave them a boot in the pants and said 'Go on and live with yourself.' "). In order to see whether there was any consistent attitude toward the new trend, these replies were compared with the replies to other questions. The doctors were, for example, called upon to state the relative importance they placed on various traits of a physician in deciding how good a doctor he is. In this context, they were asked: "Is it more important that a physician acquire additional technical skills or that he develop skill in dealing with the patient's social and psychologic problems?" Only 29 per cent of the doctors who replied cast their votes for additional technical skills; 42 per cent called for developing greater skill in dealing with social and psychologic problems; and 29 per cent insisted that it was impossible to choose between these two alternatives. As was expected, these replies were highly associated with those to the question about psychosomatic medicine (Table XI). Nevertheless, the consistency of the replies to these two questions is not sufficient proof that a fundamental attitude toward psychology in medicine exists, especially since the questions contain the words "psychosomatic" and "psychologic." It is well known that people will often give a favorable verbal response to a fashionable term when it is presented to them, although the corresponding idea may play a very small role in their actions. (And, conversely, some other ideas have names that carry such a strong negative charge—"vivisection," for example—that people will often express strong disapproval when asked about the idea by name, although they will not object to the action when it is described in more neutral terms.) The doctor's responses to the questions about "psychosomatic medicine" and "psychologic problems" were compared with their statements in other contexts where they were not confronted with these charged words but nevertheless had an opportunity to volunteer their concern, if any, with psychologic aspects of medicine. One of these op-

TABLE XI. ASSESSMENT OF CURRENT EMPHASIS ON PSYCHOSOMATIC MEDICINE AND OF THE IMPORTANCE OF A DOCTOR'S SKILL WITH SOCIAL AND PSYCHOLOGIC PROBLEMS

CURRENT EMPHASIS ON PSYCHOSOMATIC MEDICINE IS	IT IS MORE IMPORTANT THAT A DOCTOR DEVELOP		
	SOCIAL-PSYCHOLOGIC SKILLS	BOTH	TECHNICAL SKILLS
Not enough	52%	32%	23%
Just right	28	45	42
Too much	20	23	35
	100% (85)	100% (60)	100% (62)

portunities arose in answering the question, "What is your usual treatment for essential hypertension in mild or moderate cases?" Those who treated hypertension could reply in a great variety of ways. Some simply gave the name of the most frequently used drug, and others described the management of hypertensive patients in considerable detail. Table XII indicates how frequently each of several areas of treatment was mentioned. Only 19 per cent of the doctors treating hypertension mentioned any psychotherapeutic steps, although this term was interpreted quite liberally in classifying the responses, including, for example, such statements as: "I talk with them and try to make them see what they're worrying about."

TABLE XII. WHAT IS YOUR USUAL TREATMENT FOR ESSENTIAL HYPERTENSION IN MILD OR MODERATE CASES?
(Frequency With Which Various Areas of Treatment Were Mentioned)

AREAS OF TREATMENT	MENTIONED BY THE FOLLOWING PER CENT OF DOCTORS	
Drugs		
Drugs only	59%	
Drugs and other areas combined	41	
Total		100%
Diet, weight control		19
Moderation of activity		15
Psychotherapeutic steps		
Reassurance about the disease only	7%	
Other psychotherapeutic steps	12	
Total		19%
(Number of doctors treating hypertension)		(119)

This does not, of course, mean that with the remaining 81 per cent psychologic considerations play no role in the management of essential hypertension; occasionally they were asked about that explicitly, and the answer was always in the affirmative. It is a rare doctor who will not at least attempt to give a patient suffering from essential hypertension some reassurance. (The interview questions preceding the discussion of hypertension probably concentrated the doctors' attention on drug therapy.) But the 19 per cent who did volunteer information about psychologic steps were evidently more concerned with them—the subject of psychologic treatment was more salient with them than with the majority of the doctors. How does this spontaneous mentioning of psychologic considerations in hypertension compare with the responses obtained when "psychosomatic medicine" and "psychologic problems" were explicitly asked about? The comparison is made in Table XIII. Those who spontaneously mentioned psychotherapeutic steps in the treatment of hypertension gave many more favorable replies to the two explicitly psychologic questions than those who made no spontaneous mention of these steps. This indicates strongly that the responses to the explicit questions were not just reactions to "charged symbols."

TABLE XIII. CONCERN WITH PSYCHOTHERAPEUTIC STEPS IN HYPERTENSION AND ASSESSMENT OF PSYCHOLOGIC CONSIDERATIONS

	IN DESCRIBING THE USUAL TREATMENT FOR ESSENTIAL HYPERTENSION, ANY PSYCHOTHERAPEUTIC STEPS WERE	
	MENTIONED	NOT MENTIONED
Current emphasis on psychosomatic medicine is		
Not enough	55%	35%
Just right	23	44
Too much	23	21
	100% (22)	100% (94)
It is more important that a doctor develop		
Social-psychologic skills	51%	43%
Both	26	32
Technical skills	13	25
	100% (23)	100% (96)

But it is possible to test this claim still further, for the doctors who were interviewed had still other opportunities to show, by their spontaneous remarks, their concern with psychologic considerations in general medical practice. The doctors were asked, for example, whether patients ever suggested a treatment for themselves and, if so, whether it was ever important to follow their suggestions. The replies ranged from an outraged, "Never—*I'm* the doctor," to "Sure—you've got to do that every once in a while." The bulk of the doctors (74 per cent) allowed that it was sometimes wise to accept patients' suggestions, although they postulated many qualifications. Many reasons for accepting them were mentioned; in 37 per cent of the cases, the reason was that following a patient's suggestion might help the patient psychologically. This was characteristically expressed as follows: "Because it gives him more confidence in the prescription. It depends a little on the nature of the patient," or, "If the medicine can do no harm I take advantage of the psychologic help that may be given by prescribing the drug as suggested by the patient."

Such remarks, in reply to a question that in no way directed the doctor's attention to psychologic factors, would seem to show an above-average concern with psychologic considerations in the general context of the handling of the doctor-patient relationship. Earlier, we recorded expressions of the same concern in the more narrow context of the treatment of hypertension, a disease well known to be susceptible to psychologic influences. Is it really the same concern in both cases, in the sense that the doctors who express it in one context also tend to express it in the other? The answer may be found in Table XIV. Evidently, the same tendency finds expression in both contexts; among those who volunteered psychologic reasons for sometimes accepting a patient's suggestion, mentions of psychotherapeutic steps in hypertension occurred twice as often as in the other group. Seeing this, it is no longer surprising to find in

Table XV that volunteering these psychologic reasons is accompanied by a disproportionate tendency to give affirmative answers when psychologic considerations are explicitly asked about. Thus all four of the possible expressions of a favorable attitude toward psychologic considerations in general medicine are positively correlated. This can only mean that such an attitude really exists, that doctors do indeed tend to act consistently in accord with their more or less favorable stand on this issue.

TABLE XIV. PSYCHOLOGIC REASONS FOR FOLLOWING PATIENTS' SUGGESTIONS AND CONCERN WITH PSYCHOTHERAPEUTIC STEPS IN HYPERTENSION

IN DESCRIBING THE USUAL TREATMENT FOR ESSENTIAL HYPERTENSION, ANY PSYCHOTHERAPEUTIC STEPS WERE	IS IT SOMETIMES IMPORTANT FOR A DOCTOR TO PRESCRIBE A DRUG BECAUSE IT WAS SUGGESTED BY THE PATIENT?	
	YES, IT MAY HELP THE PATIENT PSYCHOLOGICALLY (VOLUNTEERED REMARK)	NO SUCH REMARK VOLUNTEERED
Mentioned	33%	16%
Not mentioned	67	84
	100% (24)	100% (95)

TABLE XV. PSYCHOLOGIC REASONS FOR FOLLOWING PATIENT'S SUGGESTIONS AND ASSESSMENT OF PSYCHOLOGIC CONSIDERATIONS

	IS IT SOMETIMES IMPORTANT FOR A DOCTOR TO PRESCRIBE A DRUG BECAUSE IT WAS SUGGESTED BY THE PATIENT?	
	YES, IT MAY HELP THE PATIENT PSYCHOLOGICALLY (VOLUNTEERED REMARK)	NO SUCH REMARK VOLUNTEERED
Current emphasis on psychosomatic medicine is		
Not enough	47%	36%
Just right	30	38
Too much	23	26
	100% (30)	100% (177)
It is more important that a doctor develop		
Social-psychologic skills	52%	11%
Both	19	31
Technical skills	29	28
	100% (31)	100% (185)

This, however, does by no means prove that the doctor who is consistently favorable to the modern tendency to give weight to psychologic considerations does so *because* it is modern, from some general respect for modern advances.

In fact, one occasionally hears remarks to the effect that "psychosomatic medicine" is just a fancy word for what the good family doctor has always done. One physician said, "Doctors have been doing this [psychosomatic medicine] before the term was invented. This is just another one of these new terms that are flowing around." And another remarked, "The successful doctor has mastered the art of psychosomatic medicine. It's just the public that is talking about it." But while the emphasis on psychologic factors in medicine represents, to some doctors, a return to practices which had been in eclipse during the "era of aseptic medicine," it is nevertheless a fact that this emphasis has increased considerably over the last two decades. To what extent and in what sense the doctor who participates in this trend is being modern is not a simple question. Suffice it to point out, for the moment, that it is the most recently educated doctors who display the most favorable attitude toward the psychologic trend, as seen in Table XVI. The data in Table XVI refer only to general practitioners, internists, and pediatricians, because the pattern for doctors in the remaining specialties is an erratic one. This is not surprising since it is chiefly in the work of general practitioners, internists, and pediatricians that psychologic considerations are at issue. (In order to measure the doctor's over-all attitude toward psychologic considerations, his responses to all 4 of the questions previously discussed were combined into an index. The percentages shown in Table XVI are those of the doctors ranking above the midpoint on this index.) The younger doctors, the doctors with the more recent education, clearly show the more favorable attitude toward the consideration of psychologic factors in medicine. In this sense, then, such a favorable attitude is one way of being modern.

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TABLE XVI. ATTITUDE TOWARD PSYCHOLOGIC CONSIDERATIONS IN MEDICINE, BY YEAR OF GRADUATION
(General Practitioners, Internists, and Pediatricians Only)

	AMONG DOCTORS WHO GRADUATED FROM MEDICAL SCHOOL				
	1929 OR BEFORE	1930 TO 1934	1935 TO 1939	1940 TO 1944	1945 OR LATER
Per cent having favorable attitude toward psychologic considerations	43% (28)	45% (20)	68% (31)	53% (19)	81% (16)

THE QUESTION OF A MORE ACTIVE ROLE FOR THE PATIENT IN HIS RELATIONSHIP WITH THE DOCTOR

The focus on psychologic factors in modern medicine, to be sure, is only one of a very broad array of changes that have come about in the way doctors look upon their patients and patients look upon their doctors. A profound restructuring of the entire doctor-patient relationship has been taking place. A 33-year-old obstetrician commented: "People are more demanding. They resent the fact that they won't get well immediately. The doctor's whole way

of life is harder, it's going too damned fast. On the other hand, patients are not so afraid any more of taking medicines." An internist remarked, "There is a much greater problem in doctor-patient relationships. Nowadays, you give a shot of penicillin for pneumonia and cure the patient, but that's no credit to the doctor. All credit goes to the drug. An old doctor wouldn't have had so many patients. He would sit at the patient's bedside until the fever broke." A pediatrician found ". . . people much more informed as far as medicine is concerned, more specialty-conscious, easier to deal with, and more concerned about preventive medicine." Perhaps the most succinct statement of the changed doctor-patient relationship, with its simultaneously welcome and unwelcome aspects, was made by a surgeon who summed up his account with the words, "We're not gods any more. It's a tragedy, but it's good."

We will focus here on only one of the many facets in which the doctor-patient relationship has undergone changes and is still undergoing them: the fact that, for better or for worse, patients talk back to the doctor more than they used to. "The patient comes in with his own diagnosis, the medicine he'd like to take, and too many questions you can't answer," according to a young general practitioner. While patients once accepted what the doctor told them to do without question, they are very likely to demand explanations today. An elderly internist reported, "People are so different on this than they were 10 years ago. I dispense about half, and they ask as much about what I dispense as what I prescribe. They're more conscious of such things than they were—I guess it's what they read in the papers and magazines."

Different doctors have different reactions to this situation. This was revealed in our interviews when doctors were asked: "Do your patients sometimes ask you for explanations about the prescriptions you give them? What do you do when that happens?" Eighty-four per cent of the doctors replied that they always give explanations when asked, if not before. But the reasons they volunteered for giving explanations were very diverse. Some doctors thought that giving explanations was important because it is good for the patient psychologically. Many others liked to give explanations because it made the patient more cooperative in the treatment and enabled him to follow instructions better. An entirely different kind of reason is expressed in the following reply by a surgeon: "I try to explain it to them as fully as possible. I believe that they are entitled to know." A pediatrician answered similarly: "I routinely explain the prescription . . . I should think they'd like to know; when they go to the drug store and pay several dollars they want to know what they're getting." The same feeling was very emphatically expressed by an obstetrician-gynecologist: "I tell them. I believe patients ought to know everything they want to know. If a doctor can't afford to part with his knowledge and tell his patients, then he is either very insecure or else he doesn't know what he should know." By such remarks one sees that explanations are given to patients not merely because they may be good for the patient or make him more cooperative, but because the patient is entitled to explanations as a matter of right. This bespeaks a definition of the doctor-patient relationship which assigns to the patient much more equality with the doctor than what previously was traditional.

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The very idea that patients, or laymen generally, can benefit from more than the most superficial explanations of medical topics is a departure from the traditional definition of the patient's proper role. This has become more of an issue with the increasingly frequent dissemination of medical knowledge—or pseudoknowledge, as the case may be—through the lay press, magazines, and radio and television programs. When asked, "Does the appearance of information on medicine in the lay publications do more harm or more good?" only about one-third replied more good, but one of the most frequently mentioned good effects of medical information in the lay media was that it "makes people curious, and then they ask us questions," or that it "makes patients more demanding of better medicine," and thereby "stimulates doctors to be on their toes." In other words, this form of information is welcomed because it makes the patient a more active and better participant in medical deliberations. While this view was expressed by only a minority of the doctors, it certainly constitutes a departure from the role traditionally assigned to the patient.

Finally, some doctors allow that the patient may have something worthwhile to contribute to the planning of his own treatment. It was seen earlier in the article that 74 per cent of the doctors interviewed conceded that it was sometimes important for a doctor to prescribe a drug because it was suggested by the patient. But this by no means necessarily meant that they respected the patient's judgment as objectively valid—far from it. One doctor, for example, said, "That's what the art of medicine is—you humor them until you think you can do what ought to be done." Other doctors followed patients' suggestions for psychologic reasons. Such reasons, as was seen earlier, expressed a general concern on the part of the doctor with psychologic considerations. A few doctors gave as a reason for following a patient's suggestion that it was sometimes useful in preventing defections: "You have to give something, even placebos, if you want to hold patients." But 17 per cent of the doctors actually gave the patient credit for making a positive contribution—either in the form of a good idea or in the form of some information which the doctor himself could not possess. For example, "The patient may suggest something that will actually help him, that I haven't thought of. It's worth a trial. That happens every once in a while," or "Occasionally a patient will give you information regarding his own reaction, both good and bad, to a certain drug."

The following is a particularly forceful expression of a stand in favor of the patient's equality: "The doctor should not be mystical. He should consider the patient as an equal partner—as intelligent as himself—and give the patient a chance to help the doctor by trying to figure out problems together. The patient should have the freedom and the chance to say what he thinks about a certain therapeutic approach."

We have now examined three of the many different ways in which the modern doctor may accord the patient some of this equality which has traditionally been regarded as out of place in the professional relationship: (1) he may feel that the patient is entitled, as a matter of right, to explanations of the treatment given him; (2) he may allow that patients can and do benefit from medical information disseminated to laymen; and (3) he may give the patient credit

for actual contributions to the planning of his own treatment. However, it cannot be stated with certainty on the basis of our data that these three attitudes are expressions of a single underlying tendency on the part of the doctor. While doctors favorable to any one of the three attitudes do have a somewhat greater-than-average tendency to be favorable to the other two attitudes also, the tendency is extremely slight. Furthermore, none of the three attitudes are any more prevalent among the doctors sympathetic to psychologic considerations than among those showing reserve about the utilization of psychologic concepts. This fact in itself does not speak against the consistency of the tendency to grant the patient equality, since it is, of course, quite possible to be "psychologic" in one's treatment of patients in a paternalistic way, without taking the patient into one's confidence. In this connection it is interesting to note that the three presumed ways of granting the patient equality were *least* frequent among those doctors who ranked "the respect of his own patients" first in answer to the question, "How would you rank the importance of these characteristics in recognizing a good doctor in a town like this: The respect in which he is held by his own patients, his general standing in the community, the recognition given him by his local colleagues, and the research and publications he has to his credit?" Altogether, 36 per cent of the doctors gave first place to the "respect in which he is held by his own patients." In Table XVII this response is compared with the responses to the three questions examined above. Those who appear most willing to grant the patient a role in medical deliberations show least concern with the "patient's respect." Evidently "patient's respect" was interpreted here rather literally as something akin to awe, and not in its broader meaning of appreciation of the doctor's services.

TABLE XVII ATTITUDES TOWARD EQUALITY IN THE DOCTOR-PATIENT RELATIONSHIP AND RELATIVE IMPORTANCE OF "PATIENT'S RESPECT"

	NUMBER OF QUESTIONS ANSWERED IN A WAY FAVORABLE TO GREATER EQUALITY IN THE DOCTOR-PATIENT RELATIONSHIP		
	TWO OR THREE	ONE	NONE
Per cent who ranked "patient's respect" first among 4 criteria of a good doctor	28% (39)	34% (74)	43% (63)

DOCTOR'S OPINIONS ABOUT MODERN DEVELOPMENTS AND INNOVATIONS

If we do grant that doctors have a consistent underlying attitude for or against the patient's more equal role in medical deliberations, we must still repeat the question asked earlier with respect to the doctor's attitude toward the role of psychologic considerations in medicine: "In what sense, if any, is a favorable attitude toward this modern trend really an expression of 'modernity'?" It has been pointed out that a doctor's acceptance of a more active role for the patient was not statistically associated with the doctor's sympathy with another

modern trend, that toward greater utilization of psychologic considerations in medical practice. The reader will also have correctly divined that neither of these two forms of being modern was found systematically related to being modern in one's prescription habits. And unlike the concern with psychologic factors, the willingness to grant the patient greater equality is not any more prevalent among the more recently educated doctors than among their older colleagues. It is, however, strongly associated with the doctor's over-all feeling of satisfaction with modern developments in medicine. The doctors interviewed were asked to list all the ways in which the "new developments have made a doctor's practice easier or harder." Table XVIII compares their replies with their willingness to grant the patient a more equal role. Table XVIII shows that doctors who will not or cannot go along with the patient's active role are much more likely to find many sources of dissatisfaction in the over-all recent developments in medicine than their colleagues who go along with the trend toward the patient's more active role. In this sense, acceptance of a more equal doctor-patient relationship is part of a more general attitude of sympathy toward modern developments in medical practice.

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TABLE XVIII. ATTITUDE TOWARD EQUALITY IN THE DOCTOR-PATIENT RELATIONSHIP AND OVER-ALL SATISFACTION WITH MODERN DEVELOPMENTS IN MEDICINE

	NUMBER OF QUESTIONS ANSWERED IN A WAY FAVORABLE TO GREATER EQUALITY IN THE DOCTOR-PATIENT RELATIONSHIP		
	TWO OR THREE	ONE	NONE
Per cent who could mention more than one way in which new developments have made a doctor's practice harder	23% (39)	27% (74)	48% (63)

Interestingly, acceptance of the more equal doctor-patient relationship is the only one of the several types of innovating behavior examined which is associated with greater general satisfaction with modern developments in medical practice. Neither the sympathetic attitude toward psychologic considerations nor the early adoption of new drugs, nor the more extensive use of modern drugs (all examined earlier in this article), are any more prevalent among the doctors who express high satisfaction with the general modern developments than among their colleagues who are critical of the recent trends. Perhaps this is a sign that the question of the doctor-patient relationship, at the broad level at which it is involved here, is the most pervasive of all the issues examined, the one that is most likely to color the entire atmosphere in which the doctor's work is carried on.

By contrast, early adoption of new drugs is perhaps the most circumscribed of the types of innovating behavior which have been examined. Whether a doctor habitually introduces new medications a few months earlier or later—

even if he does so consistently—alters the way his practice is carried on very little. Appropriately enough, therefore, this promptness to try new drugs, while not related to the doctor's general satisfaction with modern developments, is related to an expression of sympathy for modernism of a more circumscribed sort. In the course of being questioned about the relative importance they placed on "various traits of a physician in deciding how good a doctor he is," the doctors interviewed were asked: "Would you have more respect for a physician who exhibits readiness to try new forms of treatment or one who makes sure to follow *only* practices which have been well tried and tested?" Altogether, 37 per cent expressed greater respect for one who shows readiness to try new forms of treatment; 12 per cent said that it was impossible to choose; and 52 per cent of the doctors chose the more conservative alternative. It is among this last group that long delays before the first use of new drugs were most prevalent, as shown in Table XIX. Half of the doctors who expressed respect for the more conservative trait in a colleague fell into the least prompt class by their own prescription record. This was true for only one-third of the doctors who expressed greater respect for the more experimentally-minded colleague. Thus the doctor's actual behavior conforms to his conscious judgment about being progressive in this rather specific, restricted sense. This judgment, on the other hand, bears no systematic relationship to any of the other forms of innovating behavior which have been examined—greater extent of use of recently developed drugs, greater consideration given to psychologic factors, and greater sympathy shown for an active role of the patient in the doctor-patient relationship. The probable reason is that these forms of modern behavior have more pervasive implications and ramify into more aspects of a doctor's practice than are expressed in the limited statement about new forms of treatment and practices well tried and tested. Thus different aspects of "doing the modern thing" have different implications for the doctor's practice and different meanings in his thinking.

TABLE XIX. TIMING OF FIRST USE OF THREE NEW DRUGS AND RELATIVE IMPORTANCE ATTACHED TO CERTAIN TRAITS OF A GOOD DOCTOR

TIMING OF FIRST USE OF THREE NEW DRUGS	AMONG DOCTORS WHO EXPRESSED RELATIVELY MORE RESPECT FOR PHYSICIANS WHO		
	FOLLOW ONLY THE WELL-TRIED	IMPOSSIBLE TO CHOOSE	TRY NEW FORMS
Least prompt	49%	47%	34%
Intermediate	30	26	42
Most prompt	21	26	24
	100% (89)	100% (23)	100% (66)

SUMMARY AND CONCLUSION

A preceding article[1] has presented, as a case study of a medical innovation, the fate of a particular new drug in the hands of the doctors of four communities. It was shown how the use of the new drug spread gradually among the physicians of these four cities. The present article deals with the question of whether or not the early users of this particular new medicine showed any signs of favoring more innovations than their colleagues and to what extent the data support the assertion that there exists a generalized tendency or trait to favor innovations which is strong in some doctors and weak in others. It is now possible to summarize the positive as well as the negative findings of this article in the following way.

1. Two hundred and sixteen physicians practicing in four cities were interviewed and pharmacists' prescription records over a period of 16 months were searched. Information of a more or less complex sort was collected and examined on 16 different items of the doctor's habitual behavior and judgment, each being one possible aspect of doing or approving in one's practice what is newest. These 16 items ranged in breadth from as circumscribed a datum as the date of the doctor's first prescription for a certain new drug to as pervasive a principle as that of the patient's right to be a partner in deliberations about his case.

2. None of these 16 different ways of "doing the modern thing" was found to be correlated with all the others, but each was correlated with some of the others. This means that there is not one over-all trait or tendency toward being modern or conservative, but rather a number of distinct areas with respect to which a doctor might be more modernistic or more "conservative." The areas or dimensions that could be discerned within the range of the limited data available are: (a) the promptness with which the doctor prescribes newly released drugs, (b) the range of different situations in which he prefers newer drugs once they have been in general use long enough that preferences for them have reached an equilibrium point, (c) the degree to which he utilizes psychologic considerations in general medicine, and (d) his acceptance or rejection of a more equal and active role for the patient in his relationship with the doctor.

3. There was a strong internal correlation between the several different items which make up each of these 4 areas, with the exception of the last one (patient's active role), where the finding is inconclusive. For example, doctors who were prompt to try one new drug were also likely to be prompt to try a second and third drug. Doctors who preferred certain new classes of antibiotics for a wide range of infectious conditions were also especially likely to make use of them in early stages of the diagnosis of a given case. Doctors who showed concern with psychologic steps in the treatment of essential hypertension were more likely than the average to follow a patient's suggestions because it would benefit him psychologically. This means that the doctor's usages within each of the 4 areas—with the possible exception of acceptance of the patient's more active role—are to a large extent expressions of consistent, underlying tendencies or traits of the doctor and not merely the results of the peculiarities of each new situation.

On the other hand, no connection could be proved between the 4 areas, indicating that we deal with at least 4 distinct dimensions of being modern rather than with a single trait.

The fact that doctors who were prompt to try one new drug were also likely to be prompt to try a second and third drug also indicates that the findings reported in our first article may have fairly wide applicability.

4. A comparison of the doctors' own statements with their prescription records shows that they tend more often to exaggerate the promptness of their adoptions of new drugs than to underrate it. This indicates the value placed on being up to date by a substantial number of physicians.

5. Some clues to the different psychologic meanings that these 4 dimensions of being modern may have for the doctor can be gleaned from certain of their attitudinal and background correlates. The first 2 dimensions refer to the use of new drugs and thus have an inherent meaning of being modern. Moreover, promptness in the use of new drugs was most prevalent among those doctors who expressed an explicit verbal judgment in favor of readiness to try new forms of treatment. The degree of utilization of psychologic considerations—certainly on the increase in American medicine over the last 20 years—was highest among the most recently educated doctors. Any rejection of the modern trend toward a more equal and active role for the patient was accompanied by dissatisfaction with the over-all effects of recent developments in medicine upon a doctor's practice. This picture requires much further exploration.

6. Investigation is proceeding to discover the extent to which the factors that favored promptness in trying a new drug may also accompany each of the other dimensions of innovating behavior in medicine.

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SURVIVAL RATE OF PATIENTS HOSPITALIZED WITH THE DIAGNOSIS OF GENERAL PARESIS

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AN EXAMINATION of the survival rate in cases of general paresis appears to be of interest for several reasons:

1. There are few diseases in which life expectancy has undergone so marked a change in recent years as has general paresis. A clear picture of this is seen when recent data are compared with those of 40 years ago, before the first successful treatment methods of general paresis were discovered.

2. There are no studies published which compare the survival rate of general paretics to a sample of the general population, matched for sex and age and historical period.

3. There are very few long-term studies in which patients were followed for 25 years or more; still fewer studies are reported in which 100 per cent of the original sample could be followed.

4. Though new cases of general paresis occur less frequently than they did before the discovery of penicillin, they do occur. At the present time these new cases together with the old ones occupy 87 beds in the Veterans Administration (Neuropsychiatric) Hospital, Bedford, Massachusetts, or 4.8 per cent of the total number of patients of that hospital.

The two samples of general paretics studied in this report are made up of patients who are or were at one time hospitalized at the Veterans Administration Hospital, Bedford, Massachusetts. This hospital was opened on June 17,

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1928, at a time when fever therapy for general paresis was already an established method. Interestingly, the first patient admitted to this hospital was a general paretic. He is still alive (April, 1958) and still a patient here.

Before describing the results of our statistical study, several points must be clarified.

CASE MATERIAL

1. Our patients were a homogeneous group in so far as all were males and veterans. They had, therefore, all passed the medical examination for fitness in the military service.

2. Before entering our hospital, designed to treat mostly chronic mental illness, many of our patients had been treated in other hospitals such as the Boston Psychopathic Hospital.[1] Thus, potentially absent from our group of general paretics are those patients who were cured in a short time. Also absent from the chronic hospital population are those who died shortly after admission to the acute hospital.

3. During the 28 years of this hospital's existence our patients were treated according to the prevailing medical opinion and the development of new drugs. Malaria therapy and other fever therapies, Neoarsphenamine, Mapharsen, bismuth preparations, and Tryparsamide were used until the advent of penicillin. During the last few years the treatment has been almost entirely restricted to the use of penicillin. The features of our samples described above are obviously not representative of the total general paretic population. However, in many respects, comparable patient groups are found not only in other V.A. neuropsychiatric hospitals but also in the state hospitals, so that our study samples may be to a high degree similar to a substantial number of paretic patients in a large group of hospitals.

ANALYSIS OF THE PRESENT GENERAL PARETIC POPULATION*

The hospital had 87 male paretics among its population of 1,800 neuropsychiatric patients on Jan. 31, 1957. The age distribution of these patients is shown in Table I.

TABLE I. AGE DISTRIBUTION OF PATIENTS WITH GENERAL PARESIS

AGE IN YEARS	NUMBER OF CASES
Under 30	0
30–39	2
40–49	5
50–59	14
60–69	64
70+	2
Total	87

*In the V. A. Hospital, Bedford, Massachusetts.

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We see from this table that 80 patients were 50 years of age or older (mostly World War I veterans). These elderly patients presented the clinical picture commonly called "burnt-out general paresis." Only 7 patients were less than 50 years old. They were admitted more recently, and their small number is obviously due to better treatment and control of syphilis in recent years. These 7 patients had apparently not been treated or had not been treated sufficiently to prevent the development of general paresis. Whether these men were not intelligent enough to recognize that they had contracted syphilis, or whether they did not care or may even have purposely hidden the fact, could not be established. All 7 are severely deteriorated paretics who will probably never leave this hospital.

Table II shows how many years these 87 patients had been hospitalized in a mental hospital. No distinction was made as to whether the patient had been hospitalized only in the V.A. Hospital, Bedford, or whether he previously had been in another hospital.

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TABLE II. YEARS OF HOSPITALIZATION IN MENTAL HOSPITALS OF THE PATIENTS WITH GENERAL PARESIS

YEARS OF HOSPITALIZATION	NUMBER OF CASES
Less than 5	4
5–9	6
10–14	14
15–19	19
20–24	20
25+	24
Total	87

When considering the fact that 44 patients—almost exactly half the number of patients with general paresis—have been hospitalized over 20 years, one should keep in mind that before the discovery of malaria therapy by Wagner-Jauregg (1917) the average life expectancy for a hospitalized male general paretic was very short. For example, Briner[2] found that the average duration of life of a patient after the diagnosis of paresis was made (and before fever therapy was introduced) was 3.6 years in the taboparetic; 2.5 years in the manic; 1.4 years in the depressive; and 1 year in the agitated forms. Derby[3] reported that in the days of custodial care in the Brooklyn State Hospital, 1917-1921, the average hospital duration of life of patients with general paresis was 1.48 years. How much life expectancy for paretics changed shortly after introduction of malaria treatment and other effective therapies has been described repeatedly in the literature.[4] Thus Pollock[5] noted that 82.1 per cent of male paretics admitted in 1920 to the New York State Hospital died in less than 4 years, while only 41 per cent of male paretics admitted in 1931 had died within the same length of time.

LENGTH OF LIFE AND SURVIVAL RATIO OF THE FIRST ONE HUNDRED PATIENTS ADMITTED WITH DIAGNOSIS OF GENERAL PARESIS

The following analyses are concerned with the length of life and the survival ratio of the first 100 patients admitted to our hospital with the diagnosis of general paresis of the insane. These patients were all admitted during a relatively short period of time, namely between June 17, 1928, and Feb. 6, 1933. These patients were selected in order to obtain a lengthy follow-up period, in this case covering 24 to 29 years.

Table III listed the number of patients who died according to the number of years following their admission. It also shows the survivors at the end of this study, June 30, 1957.

TABLE III. FOLLOW-UP OF FIRST 100 PATIENTS ADMITTED WITH GENERAL PARESIS BETWEEN 1928 and 1933

YEARS AFTER ADMISSION	NO. OF DEATHS	CUMULATIVE PER CENT DYING
1st	9	9
2nd	4	13
3rd	5	18
4th	5	23
5th	2	25
6th	2	27
8th	1	28
10th	1	29
11th	1	30
12th	2	32
13th	1	33
14th	4	37
16th	2	39
17th	5	44
18th	2	46
19th	1	47
22nd	3	50
23rd	1	51
24th	2	53
26th	2	55
27th	1	56
28th	1	57

Status on June 30, 1957

Dead	57
Living	43
Total	100

From Table III we can see that 23 per cent of the patients died during the first 4 years after admission, as compared to Pollock's 82.1 per cent in 1920. Between the time of admission and the end of the twenty-second year after admission 50 patients had died, or, expressed positively, 50 per cent of the original 100 patients were still alive 22 years after admission. When making these comparisons, however, we must not forget the previously mentioned characteristics of our group, especially that these patients were generally not admitted in the acute stage of the disease with its high mortality.

Since 43 of the original group of 100 were still alive at the conclusion of this study, it is obviously impossible to determine the average life span for these patients. This can be done only after everyone has died. But even if this were possible on a future date, the determination of the average time span between admission and death would have only very limited value as the survival period will be affected by the different ages of patients on admission.

More informative than such a figure is the comparison of survival rate of our patients with the survival rate of the general population. In gathering data for this comparison we did not try to establish from the records and death certificates the diagnosis listed as responsible for the patients' death. This aspect was omitted since "cause of death" data are generally unsatisfactory. Furthermore, the lethality of general paresis may be expressed in production of other terminal conditions or in failure to resist other diseases. Therefore, instead of distinguishing between patients who died because of their paresis from those who died of "other causes," it seemed more appropriate to ask, "What extra load of mortality is carried by patients with general paresis?" This required a comparison with a group not having this extra load. Such a comparison group was constructed and made up of unselected white males of the same age distribution from the United States Life Tables. The time span covered (June 17, 1928, to June 30, 1957) includes a considerable change in mortality rates in the general population as well as in paretics. Those paretics who survived the first few years benefited from the new developments in medicine in the same way as the general population did. For this reason it was necessary to base our comparison on three different United States Life Tables: for the first 5 years of experience the 1930 tables were used, for the next 10 years the 1940, and for the remainder the 1950 tables. At the time of this writing the 1955 tables were not available in a form suitable for our purposes.

The measure used in our comparison was the survival ratio, i.e., the observed survivals year by year divided by the expected survival of an unselected life table group. In other words, the measure does not express survival directly, but rather the ratio of actual survival to the survival which would be expected in an age-matched group of the general population. This ratio, therefore, will remain constant as long as the observed group is dying off at a "normal" rate. This ratio may and does go up slightly when, for a period of time, no deaths occur in the observed group. The determination of such a survival ratio also gives a much clearer and more valid picture than does the simple determination of a five-year or ten-year survival rate.*

The survival ratio curves presented here were constructed in the same manner as those by Palmer and Muench[6] for their studies on survival in hypertension. The curve represents on the ordinate the ratio of the number of survivals of the patient group to the number of survivals in the matched general population group—plotted on the abscissa against time. From the definition it follows that if the ratio of the survivors in the project to those in the matched group is unchanged for some time, then this fact is expressed by a straight horizontal

*A more detailed explanation of this procedure is presented in the appendix on statistical treatment.

line. However, when the number of survivors diminishes faster in the project group than in the control, this is expressed by a decline of this curve. A rise of the curve will occur when for a certain period fewer patients died in the examined group than in the matched group. The unbroken center line in Fig. 1 presents the observed ratio from admission for a period of 25 years. This curve shows a very steep decline during the first 4½ years and a further but less steep decline during the next 13 years; after that time the curve approaches the horizontal. This means that during the first years the *excess* mortality was very high and declined as the years went by.

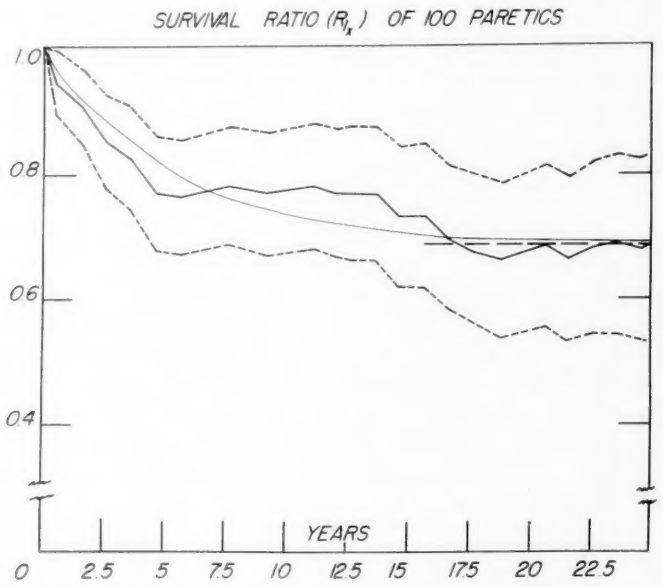

Fig. 1.—The solid angular center line depicts the observed survival ratio from the patients' admission for a period of 25.0 years. The smoothly bent line is a fitted curve (catalytic type with the formula $R = 0.680 + 0.320e^{-.188t}$). The broken lines bracketing the center are the limits of two standard errors of the survival ratio, and therefore represent 95 per cent confidence intervals for the true value.

A further analysis was made by dividing the patients in two subgroups, one consisting of 57 men who were under 40 at the time of admission, the other consisting of the remaining 43 individuals who were 40 years of age or older at that time. The survival ratios of these two groups is pictured in Figs. 2 and 3, respectively. The solid line in Fig. 2 is the observed survival ratio of the younger admission group. Of particular interest in this curve is the excess mortality rate of 42 per cent a year for one-fourth of the younger group. These patients died at an increased rate in the first 5 years after admission. The remaining three-quarters of this group have a survival rate equal to the matched normal population. The graphic representation of this fact (Fig. 2) is expressed by the rapid decline of the curve on the left and the horizontal course of the curve on the right.

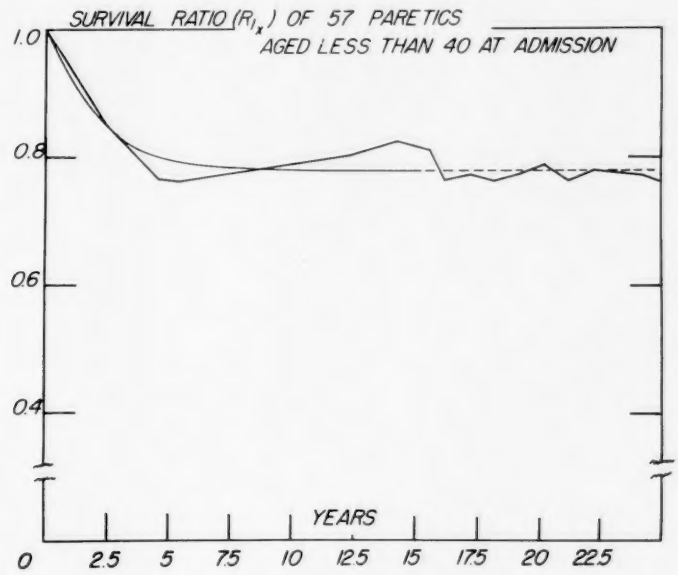

Fig. 2.—The angular line represents the observed survival ratio. The smoothly bent line is a fitted curve (catalytic type with the formula $R = 0.774 + 0.226e^{-.122t}$). The horizontal broken line on the right represents k or the fraction of the observed group which is subjected to no more than usual mortality.

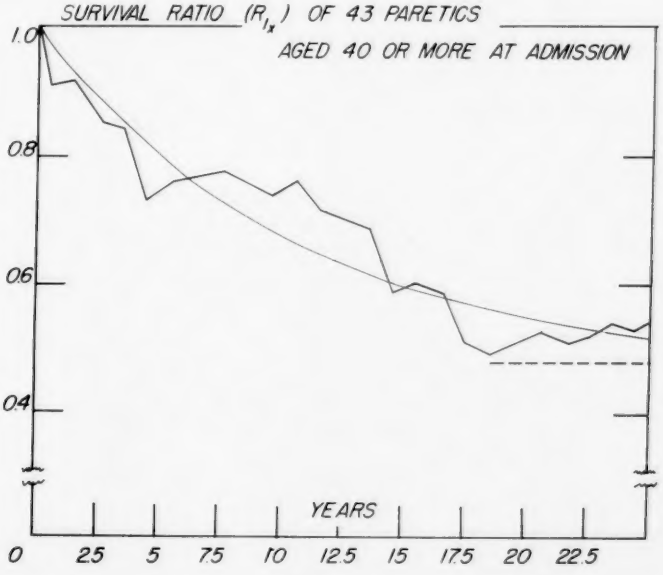

Fig. 3.—The angular line represents the observed survival ratio. The smoothly bent line is a fitted curve (catalytic type with the formula $R = 0.492 + 0.508e^{-.101t}$). The horizontal broken line on the right represents k or the fraction of the observed group which is subjected to no more than usual mortality.

Fig. 3 presents similar data for the older group. About one-fourth of the older group also died during the first 5 years after admission. The curve of their survival ratio (Fig. 3) for the first 5 years is almost identical with that of the younger age group (Fig. 2). Or, in other words, the ravages of the disease killed about 25 per cent of the patients during the first 5 years, irrespective of age; after the first 5 years, however, the two curves deviate from each other, the older group continuing for the next 10 to 15 years at a higher death rate than expected. (For a more detailed analysis see Appendix.)

DISCUSSION

The Usefulness of the Survival Ratio in Studies of Chronic Diseases Like General Paresis.—The importance of relating the survival ratio of the patient group to the survival ratio of a matched group of the general population will become obvious when other long-term follow-up studies are examined. Taddei and Cossio[11] reviewed in 1953 all the cases which had had malaria treatment for general paresis in the Psychiatric Institute of Florence during the years 1925-1936. Taddei had previously evaluated this patient group of 227 men and 71 women in 1938, and the two authors subsequently tried to determine (in 1953) the final outcome of this patient group. They state that they were stimulated to do the 1953 examination because no statistical studies existed which covered such a long time span (17 to 27 years). The status in 1953 of the initial group of 227 males was found as follows:

Healed, 15 (6.6 per cent)
Healed with defect, 4 (1.8 per cent)
Chronic deteriorated, 16 (7 per cent)
Dead, 165 (72.7 per cent)
Lost in follow-up, 27 (11.9 per cent)

These Italian authors sought to determine whether death was connected or not connected with the syphilitic disease. They noted that some of the patients who were completely healed from their paralysis had died from unrelated causes, and that three had reached an age of 80 years or more before death. They noted further that the time of war in Italy had an unfavorable influence on the death rate since at least 40 of the total group had died between 1942 and 1944—apparently in connection with insufficient nourishment and other sequelae of the war situation.

These arguments are very reasonable; however, a valid evaluation of their data could only be made if the survival rate of the studied group were compared with the survival rate of an age-matched general population group, as was done in our analysis.

Another long-term study is one by Dattner,[4] who followed, until 1938, 129 paretics admitted to the Vienna Psychiatric Clinic between 1922 and 1924. In 1938, of these 129 patients, one could not be located, 42 were remitted, 7 were stationary, and 79 were dead. Dattner argued that not all of the deaths were due to the general paresis and noted that no less than 34.1 per cent of these

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patients died of other causes. Death due to other causes is, according to Dattner, the reason why his group showed such a high mortality rate. However, this kind of argument may lead to biased results as has been lucidly explained by Berkson and Gage[12] in their statistical paper about the survival of cancer patients after treatment. They argued that it is difficult and often impossible to determine whether a death is due entirely to cancer or entirely to other causes. They state: "It would appear to be a matter of elementary interest to compare the deaths reported as from other causes than the cancer, with the number expected on the basis of some appropriate general life table. So far as the deaths attributed to other causes exceed normal deaths, even if these have been authentically recorded as to cause, it seems 'fair' to account for the excess as deaths attributable to cancer. If we allow them to be included in the calculations as from other causes, then a patient who dies of pneumonia contracted because of a lowering of resistance brought on by the cancer or its treatment is as effectively counted as representing a 'cure' as is a patient who lives out a normal expectancy, and the way is open to the achievement of a large 'cure' rate by attributing an inordinately large number of deaths to other causes."

The correctness of the argument is demonstrated also by the analysis of a feature of our case material. The death certificates of the 9 patients who died during the first year showed the following diagnoses:

One case of pneumonia of both lungs with empyema on the right side.
One case of bronchial pneumonia.
One case of chronic myocarditis.
One case of edema of lungs.
One case of acute pulmonary miliary tuberculosis.
One case of perforated ulcer of duodenum, and intra-abdominal hemorrhage.

In all these 6 cases and in the other 3, the general paresis was also mentioned on the death certificate. It appears very clear that an omission of the 6 deaths as belonging to a group of "other causes" would have resulted in biased and invalid results.

A Hypothesis for the Explanation of the Observed Survival Ratio in Patients With General Paresis.—It is of interest to examine our finding in the light of previous studies on general paretics. Malzberg[7] compared mortality figures after admission in 1910 and after admission in 1944 to 1949. He found, as expected, a remarkable decrease in the mortality rate for patients in the latter group; however, this reduction in mortality did not occur until after the first three months. During the first three months 19.0 per cent of the male first admissions died in 1910, compared with a percentage of 19.3 in 1944 to 1949. Later, however, the effect of the therapy became visible and was very spectacular when the second, third, fourth, and fifth year after admission were compared with the same time spans in the first two decades of this century. In our own experience at Bedford the mortality was also high in the first year after admission but never reached the percentage reported by Malzberg. This is most probably due to the already mentioned fact that our hospital was the second hospital

for many of our patients. Thus the majority of the patients admitted had survived the most acute stage of the disease.

The results of Malzberg and those of our study suggest three alternative explanations for the mortality rate during the first year: (1) that the therapy used (mainly fever and pentavalent arsenicals) did not arrest the progress of the disease during the early stages of treatment; (2) that the treatment (malaria, etc.) had a mortality equal to the disease during this period; and (3) some combination of these two possibilities.

Several studies[4] have reported that after therapy with pentavalent arsenicals, fever, or penicillin, the clinical symptoms respond dramatically in some cases but poorly in others, and the latter patients may continue to have signs and symptoms of mental deterioration. Dattner points to the well-known fact that brain tissue destroyed by disease cannot recover. This would explain the stationary cases. The still progressing cases are explained by Dattner as either having a nonsyphilitic psychosis which may have been "released" by the syphilitic inflammation or which was coincidental. Speaking of the older age group Dattner noted: "It is a fact that many patients with advanced general paresis have much permanent damage in the brain, and the longer they survive after antisyphilitic therapy has eliminated the syphilitic infection, the more prone are they to develop complications produced by advancing arteriosclerosis, trauma, intercurrent infections, and various other factors."

Kral and Doerken[9] went one step further. They investigated the deterioration in dementia paralytica with comparative serologic and psychologic techniques. They found that there was evidence that part of the impairment in psychologic functioning is reversible when the disease process is arrested early in the psychotic stage, although some cases continued to deteriorate even though treatment had rendered their spinal fluid negative. To explain these two opposite trends, Kral and Doerken found it necessary to consider that there are at least two pathogenic factors in general paresis: one probably connected with the inflammatory component and responsible for the acute clinical picture and the pathologic changes in the spinal fluid and relatively easily influenced by modern therapeutic methods; and another one, long acting, not easily or not at all influenced by therapy and responsible for the slowly progressing deterioration even in the therapeutically induced absence of pathologic findings in the spinal fluid. Kral and Doerken assume that this second factor may be of vascular nature as had been suggested in an earlier paper by Merritt, Putnam, and Campbell.[10]

Certain of our findings have a direct bearing on these problems. It will be recalled that in contrast to our younger age group in which 5 years after admission a normal survival ratio was achieved and maintained, the older age group continued to have an excess mortality for about 15 to 20 years longer. The following is a hypothesis proposed to explain these facts: It is well known that late syphilis affects the blood vessels and it is also well known that blood-vessel pathology in general appears more often in later years. It seems to be a reasonable assumption that tertiary syphilis may affect the blood vessels more

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in patients who are 40 years of age or older than in younger ones. Vascular syphilis may then combine with arteriosclerotic processes to produce the continuing excess mortality found in our older subgroup.

According to this hypothesis the younger group escaped the syphilitic vascular component because the syphilitic process was arrested at an age, when the patient's blood vessels were less prone to be affected by the syphilitic process. This hypothesis could be tested by statistical evaluation of autopsy material.

SUMMARY

1. Various data on two groups of general paretics, all of whom are or were patients in the V.A. Hospital, Bedford, Massachusetts, were statistically analyzed. The first group was composed of 87 patients who were still living at the time of this study in the hospital. Eighty of these were 50 years of age or older, and 44, or nearly half of them, had been in a mental hospital for 20 or more years. Their longevity was compared with statistical data of general paretics in the first two decades of this century.

2. The second group was made up of the first 100 patients who were admitted to this hospital with the diagnosis of general paresis between June 17, 1928, and Feb. 6, 1933. This group was analyzed for their death rate and for the ratio of their survival rate to the survival rate of a matched group from the United States Life Tables.

3. The determination of the ratio of the survival rate of a group of patients to the survival rate of a matched life table group is a valuable statistical method and is superior to a simple determination of a 5-year or 10-year survival time, and it is much more valid than a method which tries to exclude death from "other causes" from a statistic.

4. The result of the study showed that an extra load of mortality is carried by patients with general paresis and that the loss of life for this group is greatest in the earlier years after admission and gradually tapers off.

5. On splitting the examined population into two age groups at the time of admission to the hospital, namely, (a) under 40 years and (b) 40 years and over, respectively, a definite difference appears which is discussed, and a hypothesis for the explanation of this difference is proposed.

We wish to express our thanks to the Registrar Division of the V.A. Hospital, Bedford, Massachusetts, and especially to Miss Elizabeth A. Ahearn, the Assistant Registrar, for their help in providing the data for this paper.

APPENDIX: MEMORANDUM ON STATISTICAL TREATMENT

The Survival (or "l_x") Ratio Method used in this paper was developed by Berkson and Gage[13] of the Mayo Clinic in order to provide a logical description of survival following cancer operations. Basically, it rests on the method of cumulative survival experience, which is well described in publications such as that of Merrell and Shulman.[14]

Cumulative survival is obtained by first calculating the proportion surviving in a specified group for a stated period of observation—usually a year, although it may be for a shorter time in acute conditions. Each successive year's proportion of survivors is obtained from the group observed throughout this year (modified, if necessary, to account for decrease in number due to loss of members from observation). Proportion of survivors is based, necessarily, on larger groups during early years of a study than in later ones, since generally some subjects have started their observation periods only recently and since the original group is continually being depleted by deaths and other losses. In the present series all admissions to the study occurred over a brief period of years, and all entrants who did not die were followed over almost the maximum time span.

If a group of 100 patients is observed during their first year after entry to the study, and there are 10 deaths among them, the survival rate is 0.9 or 90 per cent. Suppose it is possible to follow 80 of these patients through their second year of observation, during which 8 die: the survival rate is again 90 per cent. The probability of surviving both years is then 0.9 x 0.9 = 0.81 or 81 per cent, and so on. The cumulative probability of surviving an entire span of years is the product of the individual probabilities for each year included. The survival probabilities are estimated as the observed proportion surviving, annually, in groups that get smaller and smaller as time goes on, so that chance or sampling variation of the estimates plays an increasing part. This is handled by calculating the "standard error" of the cumulative proportion estimated to survive, which gauges the amount by which the estimate is apt to deviate from the true value.

Cumulative survival has the great advantage of using all available data in the study, in the form of observed annual survivals and deaths. It measures the amount of total depletion, over a span of time, in a selected group suffering from a specified condition, without asking about the assigned cause of the deaths. The assumption is that, if a given group of patients is under an increased load of mortality, this load is connected with their disease condition no matter what cause is selected for tabulation by the statistician. It is possible, therefore, to compare cumulative survivals for different disease conditions, variations in type of a single disease, and other factors.

Such comparisons may introduce variations not connected with the disease conditions in question. If a younger group is compared with an older, a factor of differential mortality is included: older people will die at a faster rate than younger, aside from any possible other differences in risk involved. Similarly, males generally have a higher mortality than females, all else being equal, and "nonwhite" than "white." It is difficult, therefore, to make valid comparisons directly between conditions which may involve considerable group differences in age, sex, or race. This is especially true in the case of chronic diseases where a group of older patients followed over a period of years will show a sizable mortality even without being at any extra risk.

The survival ratio method eliminates these sources of outside variation by making primary comparisons of observed cumulative survival with what would

be expected in exactly similar but unselected groups drawn from the general population. Such comparison groups may be constructed from life tables, which give annual expected survivals for individuals in the general population by age, sex, and race. For each member of the study group observed during a year, a life-table member of identical age, sex, and race is placed in the comparison group. The total expected annual and cumulative survivals of this "normal" group can then easily be calculated.

Expected (life table) survival has changed considerably with time: age specific mortality rates in this country have shown a marked drop over the past generation, even at older ages. It is essential, therefore, that comparison be made with groups from corresponding tables. In view of the length of time covered by the present study, the comparison group was taken from three life tables: United States White Males for 1930, 1940, and 1950, each for the appropriate period of patient observation.

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The cumulative survival ratio is calculated by dividing, for each point of time, the cumulative observed survival by that expected in the life table comparison group. If the observed group is under no additional risk of death, the ratio will remain around one, or 100 per cent. Where there is added risk, the ratio will drop. If the graph of the ratio becomes horizontal, it does not mean that deaths have stopped, but rather that they are taking place at rates expected in the general population.

The survival ratio and its graph not only give information as to the amount of excess risk involved, but show something of its nature. It is often possible to express general characteristics of the ratio in terms of simple curves whose constants may be interpreted as measures of the factors involved. Thus, in the present instance, curves of the catalytic type have been fitted to the data on survival of paretics. The general formula for this type is:

$$R = k + (1\text{-}k)\, e^{-rt}$$

R is the survival ratio, k an estimated fraction of the observed group which is subjected to no more than usual mortality. The remainder, 1-k, is being depleted at an estimated excess annual mortality rate of r above usual rates.

The curve for the entire group is given by:

$$R = 0.680 + 0.320e^{-.188t}$$

which would indicate that about two-thirds of the entire series became non-progressive and experienced only life-table mortalities, while the remaining third showed an over-all excess mortality of some 19 per cent of its survivors annually. This curve is plotted in Fig. 1: the actual survival ratio appears to decrease more rapidly during the early years and more slowly later than indicated by the average value of 19 per cent.

When the total group is divided into two subgroups, one under 40 years of age at admission and the other 40 and over, the picture is quite different. Each subgroup still decreases to some 75 per cent of its expected survivals in the first 5 years or so; after this the survival ratio of the younger group flattens out (Fig. 2) while that of the older continues to decrease, possibly at a slower rate, until

it has reached a level of some 50 per cent after about 20 years, after which it, too, becomes constant (Fig. 3).

Fitted catalytic curves for the subgroups are also shown on the respective graphs. Their formulae are:

$$\text{Under 40:} \quad R = 0.774 + 0.226e^{-.422t}$$
$$\text{40 plus:} \quad R = 0.492 + 0.508e^{-.101t}$$

It must be remembered that the estimated decrease rates (approximately 42 per cent and 10 per cent of survivors annually) are average values applying to the proportions (23 per cent and 51 per cent) of the original age groups whose disease progression has not been arrested. The observed survival ratios are practically identical for about five years and then separate, eventually running along the borders of the 95 per cent confidence interval of the total group (Fig. 1). The difference in survival between the two age groups is therefore statistically quite significant.

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MULTIDISCIPLINARY STUDIES OF ILLNESS IN AGED PERSONS

II. A New Classification of Functional Status in Activities of Daily Living

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INTRODUCTION

IT HAS been stated, "The process of aging consists of those changes with time which result in progressive loss of abilities and in progressive increase in death rate."[1] The staff of The Benjamin Rose Hospital, a hospital for prolonged illness in Cleveland, Ohio, is making a continuing effort to establish methods for obtaining quantitative information about the progressive loss of abilities and progressive increase in death rate. As part of this effort, physical, social, and psychologic data are obtained in initial and repeated follow-up examinations made at comparable times during the course of illness of aged patients.

Initial methods have been evolved in relation to a study of consecutively admitted patients with fractures of the hip occurring within 6 months prior to admission.[2] The present report defines an *Index of Independence in Activities of Daily Living* that is newly evolved and more specific than previously available. Examples are presented of the use of the *Index of ADL* as a measure of the course of illness in study patients.

METHODS

The methods of accumulating and recording physical, psychologic, and social data for the present study were described previously in detail.[2] Two features of patient classification are re-emphasized. First, the functional status

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of patients during any given evaluation was recorded in terms of the specific type of assistance received. Second, the functional characterization of patients was based on actual status and not on ability. Thus, for example, a patient who refused to perform was considered as not performing the function even though he were deemed able to perform.

The Index of Independence in Activities of Daily Living presented in this paper was based on an evaluation of the functional independence or dependence of patients in bathing, dressing, going to toilet, transferring, continence, and feeding. The following specific definitions of functional independence and dependence were used in the index.

Evaluation of bathing was made in relation to either sponge, shower, or tub bathing. Patients were classified as independent if they performed the function without supervision, direction, or active personal assistance. Patients were also classified as independent if they received such assistance in bathing only a single part of the body such as the back only or the disabled extremity only. A designation of dependent status was made in patients who received assistance in bathing more than one localized part of the body or in getting in or out of the tub. Patients who did not bathe themselves at all were classified as dependent.

Evaluation of dressing was made in relation to getting clothes from closets and drawers, as well as in relation to the act of getting clothed. Clothes included underclothes, outer garments, fasteners, and braces if the latter were worn. The specific act of tying shoes was excluded from the evaluation. Patients were classified as independent if they performed the function without supervision, direction, or active personal assistance. A designation of dependent status was made in patients who received such personal assistance or who remained partly or wholly undressed.

Evaluation of going to toilet was made in relation to the act of getting to the toilet for purposes of excretion, as well as getting on and off the toilet, arranging clothes, and cleaning organs of excretion. Patients were classified as independent if they performed the function without supervision, direction, or active personal assistance. It should be noted that patients in the independent class may or may not have been using mechanical aids such as wheel chairs, canes, walkers, or other objects for support. A designation of dependent status was made in patients who received any of the indicated personal assistances or who did not perform the function. Status was considered dependent in patients who did not go to the room termed "toilet" and instead used containers such as bedpans or commodes.

Evaluation of transfer technique was made in relation to movement of patients in and out of bed and in and out of chair. Patients were classified as independent if they performed all these functions without supervision, direction, or active personal assistance. Patients in the independent class may have been using mechanical aids such as arms of chairs, bedposts, wall handles, canes, walkers, trapezes, or other objects for support. A designation of dependent status was made in patients who received any of the personal assistances in any of the transfers or who did not perform one or more of the transfers.

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Continence status was classified as independent if urination and defecation were entirely self-controlled. A designation of dependent status was made in patients who exhibited partial or total incontinence in either function. Status was also considered dependent if continence was controlled partly or wholly by others by such means as enema, catheterization, or regulated use of bedpan.

Evaluation of feeding was made in relation to getting food from a plate (or its equivalent) into the mouth. The precutting of foods such as meat and the preparation of foods were excluded from the evaluation. Patients were classified as independent if they performed the function without supervision, direction, or active personal assistance. A designation of dependent status was made in patients who received such personal assistance. Patients who did not eat at all or who received tube or parenteral feedings were classified as dependent.

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RESULTS

Sixty-four patients with fractures of the hip were admitted into the study during the first 18 months. The results reported here concerned 6-month evaluations in the first 45 patients and 1-year evaluations in the first 25.

Patients ranged in age from 54 to 99 years at the time of occurrence of the fracture with 3 patients in the 50-to-59-year group, 5 in the 60-to-69-year group, 10 in the 70-to-79-year group, 23 in the 80-to-89-year group, and 4 in the 90-to-99-year group. There were 2 male patients, one an 82-year-old widower and the other a 56-year-old man with a living spouse. The remaining 43 patients were women, including 28 widows, 3 women with living spouses, 7 who had never been married, 3 who had been divorced, and 2 who had been separated from their husbands. Widows were more prevalent in the older age groups, comprising 77 per cent of women 80 years old or older and 47 per cent of women under 80 years of age. The 3 women with living spouses were all less than 80 years of age.

After performing many functional evaluations, it became apparent that characteristic patterns of functional dependence existed in activities of daily living. The following patterns were noted in 93 of the 106 evaluations made during life in the 45 patients considered here. When personal assistance was received in relation to 1 function alone, that function was bathing. When the assistance was in relation to 2 functions, the functions were bathing and dressing. In the event of patients receiving assistance in 3 functions, the assisted functions were bathing, dressing, and going to toilet. In the event of 4 assistances, these were the foregoing 3, plus transferring; and in the event of 5 assistances, these were the foregoing 4, plus continence. Feeding assistance was the last of the 6 types of assistance required. In 12 of the 13 exceptions to this pattern, the observed pattern differed in only 1 function; and in 8 of the 12, the exception was the next function on the graded scale.

On the basis of the characteristic patterns of functional dependence in activities of daily living, a graded scale was devised by which patients could be compared according to relative independence in these activities. The following classes comprised the scale, termed the *Index of Independence in Activities of*

Daily Living. Class *A* included patients who were independent in feeding, continence, transferring, going to toilet, dressing, and bathing; *B* included those independent in all but 1 of these functions; *C* included those independent in all but bathing and 1 additional function; *D* included those independent in all but bathing, dressing and 1 additional function; *E* included those independent in all but bathing, dressing, going to toilet, and 1 additional function; *F* included those independent in all but bathing, dressing, going to toilet, transferring, and 1 additional function; and *G* included those dependent in all 6 functions. An additional class, termed *Other*, included those who were dependent in at least 1 function, but not classifiable as *A*, *B*, *C*, *D*, *E*, *F*, or *G*. Classes *A* through *G* included 105 of the 106 evaluations made during life in the 45 patients considered here. Only 1 evaluation was in the class termed *Other*. (Detailed definitions of independence and dependence in the various functions are to be found in the *Methods* section.)

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TABLE I. USE OF A GRADED INDEX TO COMPARE INDEPENDENCE IN ACTIVITIES OF DAILY LIVING PRIOR TO THE OCCURRENCE OF FRACTURES OF THE HIP AND SIX MONTHS LATER IN PATIENTS ADMITTED TO A HOSPITAL FOR PROLONGED ILLINESS

		INDEX OF INDEPENDENCE PRIOR TO FRACTURE*								
		A	B	C	D	E	F	G	OTHER	TOTAL
		PERSONS								
Index of Independence six months after fracture*	A	16	1							17
	B	3	1							4
	C	2	1	2						5
	D	2	1							3
	E	2	1	1	1					5
	F		1		1	1				3
	G	1				1			1†	3
	Other									0
	Deceased	2	1	1		1				5
	Total	28	7	4	2	3	0	0	1	45

**Index of Independence in Activities of Daily Living* (see text under *Methods* for detailed definitions of individual functions):

A = Independent in feeding, continence, transferring, going to toilet, dressing, and bathing.
B = Independent in all but one of these functions.
C = Independent in all but bathing and one additional function.
D = Independent in all but bathing, dressing, and one additional function.
E = Independent in all but bathing, dressing, going to toilet, and one additional function.
F = Independent in all but bathing, dressing, going to toilet, transferring, and one additional function.
G = Dependent in all six functions.
Other = Dependent in at least one function, but not classifiable as A, B, C, D, E, F, or G.

†Patient was dependent in dressing and continence prior to fracture and was dependent in all six functions 6 months later.

The *Index of Independence in Activities of Daily Living* was used to compare independence prior to the occurrence of fractures of the hip and 6 months later (Table I). Nineteen patients had no change in degree of independence. One patient improved, and 25 deteriorated (including 5 fatalities). The 1 patient who improved was in class *B* prior to fracture, i.e., the most independent class in which improvement was possible. Patients in more dependent classes prior to fracture showed no improvement. The proportion of patients showing deterioration (excluding fatalities) was 38 per cent of those classified as *A* prior to fracture, 56 per cent of those classified *B* and *C*, and 100 per cent of the patients in the more dependent classes. Mortality in the 3 groups was 7, 18, and 20 per cent, respectively.

The Index of Independence in Activities of Daily Living was used to compare indepencence 6 months and 1 year after the occurrence of fractures of the hip in patients still alive at 6 months (Table II). Sixteen patients had no change in degree of independence during this second 6-month interval, and 6 patients showed deterioration (including 2 fatalities). One patient showed improvement during this interval, but the status of this patient was still at a deteriorated

TABLE II. USE OF A GRADED INDEX TO COMPARE INDEPENDENCE IN ACTIVITIES OF DAILY LIVING SIX MONTHS AND ONE YEAR AFTER THE OCCURRENCE OF FRACTURES OF THE HIP IN PATIENTS ADMITTED TO A HOSPITAL FOR PROLONGED ILLNESS

		INDEX OF INDEPENDENCE SIX MONTHS AFTER FRACTURE*								
		A	B	C	D	E	F	G	OTHER	TOTAL
		PERSONS								
Index of Independence one year after fracture*	A	9								9
	B	1								1
	C			1†						1
	D				1†					1
	E			1		2†	1†			4
	F					1†	1†			2
	G						1†	2†		3
	Other									0
	Deceased				2†					2
	Total	10	0	2	3	3	3	2	0	23‡

*See text under *Methods* and Table I for detailed definitions of *Index of Independence*.

†These patients had shown deterioration in the previous 6-month interval as measured by comparing the *Index of Independence in Activities of Daily Living* 6 months after the occurrence of the fracture with the index prior to the fracture. The remaining patients in the table had not shown deterioration in the previous 6-month interval.

‡Two of the first 25 study patients died during the first 6-month interval and were not included in this table.

level when compared to status prior to fracture. Progression of deterioration during the second 6-month interval was compared in patients who had deteriorated during the previous 6-month interval with progression of deterioration in patients who had not shown such previous deterioration. Progression of deterioration occurred in 2 of 8 patients still living at the end of one year (25 per cent) who had shown previous deterioration, while progression of deterioration occurred in 2 of 11 patients still living at one year (18 per cent) who had not shown such previous deterioration. Patients in Class *G* at 6 months were excluded from the evaluation of progression of deterioration by virtue of having arrived at maximal deterioration and thus being ineligible to deteriorate further. Mortality was 17 per cent in the group with previous deterioration and 0 per cent in the group without previous deterioration.

DISCUSSION

The Commission on Chronic Illness used an "over-all functional classification" in describing disability in activities of daily living, considering that a single measure would be descriptively useful and would permit estimation of potential for improvement.[3] The classification lacked specificity in its definitions, using such terms as "slight limitation," "moderate limitation," "usual activities," "modest precautions," "alters mode of life," "most of own personal needs," and "adequate to meet his own needs." In the experience of the authors of the present report, the lack of specificity made the classification inapplicable in a comparable manner and did not permit its being used as a graded scale of activity. The classification also referred to the ability to take care of personal needs. This was unsatisfactory because tests of ability were unavailable, and ability was often obscured as in the case of patients who refused to function or who appeared poorly motivated.

Members of the staff of The Benjamin Rose Hospital also held the opinion that a single measure of functional status in activities of daily living was needed. They attempted to make a single numerical appraisal in an earlier study of illnesses of aged persons.[4] Numerical values were assigned on a graded basis to degrees of activity in specific functions, and the sum of the values for all functions was used as the single appraisal for any one person. The authors of the report stated that this means of expressing status was limited by the arbitrary nature of the numerical values and by the inability to relate such arbitrary values from one function to another, but they were interested in making the attempt in order to establish the principle of the need and its application.

The Index of Independence in Activities of Daily Living described in the present report was constructed as a result of detailed analyses of the patterns of activity status (not ability) in study patients. This *Index of ADL* was more specific than previously available and more definitely a graded scale, serving as a means of describing changes in patient status with time and as a means of comparing changes in the course of illness from one patient to another. *The Index of ADL* was also useful in teaching nurses and medical students objective ways of evaluating both the functional status and the course of illness of patients.

The *Index of ADL* demonstrated quantitative relationships between the functional status of aged patients prior to the occurrence of fractures of the hip and functional status 6 months later. Deterioration was the primary change, occurring more frequently in patients who were in the more dependent classes prior to fracture. Thus deterioration (excluding fatalities) occurred in 38 per cent of those classified as *A* prior to fracture, 56 per cent of those classified as *B* and *C*, and 100 per cent of the patients in the more dependent classes. The *Index of ADL* demonstrated progression of deterioration in the second 6-month interval after fracture. Progression of deterioration (excluding fatalities) occurred more commonly among patients who had shown deterioration during the first 6-month interval than among patients who had not shown such previous deterioration, but proof of the reality of this finding awaited the results of evaluations in larger numbers of patients.

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Interest in progression of deterioration is related to one of the oft-stated philosophies of management of aged patients in The Benjamin Rose Hospital, namely, that *the aim of treatment is to maintain the physical, psychologic, and social independence of patients on the assumption that deterioration to dependence is associated with increased progression of deterioration.* Testing this assumption requires the objective evaluation of progression of deterioration. It has been our opinion that there is need for such specific evaluations of the various philosophies of managing aged persons, since specific definitions of the limitations and applications of philosophies of management are generally lacking. Others have also expressed the opinion that independence is an important aim. Cosin[5] recommended "attainment of the greatest degree of personal independence associated with social reintegration of the personality." Dacso[6] recommended ". . .restoring disabled older persons to independent, noninstitutional existence." The aim to prolong life and promote comfort is beyond criticism; however, here again definitions of specific limitations and applications are generally lacking.[7] Lack of specificity in objectives and in the approach to these philosophies leaves many questions unanswered. Should the aged patient be urged to strive toward independence even against his desire? Is there any specific age or state of disability at which the aged patient should be advised to retire to some greater or lesser degree of dependent existence? What supervision is required to protect the aged patient from accidents, and what degree of such protection is detrimental overprotection? What is the nature of the medical, social, and other multidisciplinary resources that should be expended for the maximum benefit of the deteriorating patient? How should the needs of aged patients be evaluated, and what are the types of environments required to meet such needs? Questions of this sort are only a few of the everyday problems that beset the personnel concerned with treatment of aged patients.

SUMMARY

At The Benjamin Rose Hospital, a hospital for prolonged illness in Cleveland, Ohio, methods were established for obtaining quantitative information about the progressive loss of abilities and progressive increase in death rate of

aged patients. The methods were initially designed in relation to fractures of the hip.

In the present report, an *Index of Independence in Activities of Daily Living* was defined, newly evolved and more specific than previously available. The index was a composite evaluation of the functional independence or dependence of patients in bathing, dressing, going to toilet, transferring, continence, and feeding. Use of the *Index of ADL* in evaluating deterioration and progression of deterioration was demonstrated, and the significance of these applications was discussed.

Evaluation 6 months after the occurrence of fracture revealed deterioration in activities of daily living in 38 per cent of patients classified as *A* (according to the *Index of ADL*) prior to fracture, in 56 per cent of those classified as *B* and *C*, and 100 per cent of those in the more dependent classes. Mortality in the 3 groups was 7, 18, and 20 per cent, respectively. Progression of deterioration during the second 6-month interval was more frequent in patients who had shown deterioration in the first 6-month interval than in patients who had not shown such previous deterioration. Mortality, too, was greater in patients showing previous deterioration.

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SOME CHANGES IN THE SLEEPING AND EATING PATTERNS OF FIFTY PATIENTS WITH LONG-TERM ILLNESSES

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THE effects of various long-term illnesses on physiologic function are well documented in medical textbooks. Not so well documented, however, are the effects of chronic illness on patterns of daily living. In particular, the daily activities of chronically ill patients who are under medical care but unhospitalized would seem to require systematic investigation.[5,7,8] Otherwise the variety of their needs for care may not be completely recognized and effectively met by nursing personnel, since these patients are not subject to continuous observation as are inpatients. As a first step in ultimately uncovering the significance and range of needs presented by unhospitalized patients with chronic illnesses, this study sought to learn by means of interviews what changes had occurred in two of their daily activities: sleeping and eating.

PATIENT STUDIES

Fifty patients with long-term illnesses were studied. Each patient was under medical care. Some, but not all, could independently meet the regular expenses of daily living. None could meet the costs of medical and nursing care. All of the patients lived in a large metropolitan area.

Twenty-five of the 50 patients were selected from the general medical clinic of a large teaching hospital according to the following criteria:

1. Each was incapacitated by a chronic illness which resulted in a limited ambulatory status; i.e., he was unable to work and was confined for most of the time to his home, occupying a bed or chair. An occasional excursion, such as a visit to the clinic, typified an unusual and reasonably difficult activity for him.

2. The first two patients to arrive in the clinic each day who conformed to the above criterion were selected for interviewing. This continued until the total of 25 patients had been reached.

The remaining 25 patients had been admitted to one of several Home Care programs of approved hospitals in the city. They were receiving nursing care at home by the staff nurses of the Visiting Nurse Service of New York, who visited under the medical orders of a physician. Some were allowed to walk about the house, others were confined to bed or chair. Patients in this group were drawn from those in the daily work-load of one of the authors, a Public Health nurse in the Visiting Nurse Service.

Table I presents the age and sex of the patients. There were almost twice as many women as men in the sample; and, although ages ranged from 21 to 87, about three-fourths were over the age of 50.

TABLE I. AGE AND SEX OF PATIENTS IN THE STUDY

AGE (YEARS)	CLINIC PATIENTS			HOME CARE PATIENTS			ALL PATIENTS		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
20–29	–	2	2	1	0	1	1	2	3
30–39	–	2	2	—	1	1	—	3	3
40–49	–	4	4	—	2	2	—	6	6
50–59	1	5	6	1	1	2	2	6	8
60–69	3	5	8	3	6	9	6	11	17
70–79	2	1	3	4	4	8	6	5	11
80–89	–	—	—	2	—	2	2	—	2
All ages	6	19	25	11	14	25	17	33	50

TABLE II. PRIMARY DIAGNOSIS OF THE FIFTY PATIENTS

DIAGNOSIS*	CLINIC PATIENTS	HOME CARE PATIENTS	TOTAL
Malignant neoplasms (140–199)	3	1	4
Diabetes (260)	5	2	7
Anemias (290–293)	1	—	1
Other hematological disorders (294–299)	1	—	1
Diseases of the central nervous system (330–357)	—	3	3
Rheumatic fever and rheumatic heart disease (400–416)	3	1	4
Arteriosclerotic heart disease (420–422)	6	5	11
Other miscellaneous heart diseases (430–434)	—	2	2
Hypertensive conditions, including heart disease (440–447)	2	4	6
Chronic respiratory disease (500–527)	1	1	2
Diseases of esophagus, stomach, duodenum (540–545)	1	—	1
Diseases of liver, gall bladder, pancreas (580–587)	—	1	1
Diseases of skin and cellular tissues (690–716)	2	—	2
Arthritis (720–727)	—	3	3
Other diseases of muscular skeleton (730–749)	—	1	1
Accidents, poisoning, violence (800–999)	—	1	1
Total	25	25	50

*Diagnosis listed by three digit categories of the International Statistical Classification.

Both Home Care and clinic patients reported illnesses which had lasted from less than a year to longer than ten years. The majority (33 patients) had an illness which was of less than five years' duration.*

*For the 25 patients receiving Home Care, the only available data on the length of illness were those obtained from the patients themselves. For the 25 patients interviewed in the clinic, it was possible to check their replies against a physician's history in the hospital record. In all except 2 cases, the physician placed the date of onset earlier than did the patient. While the patient seemed to date the onset from the time of diagnosis, the physician was able to recognize the significance uncovered in the patient's history which often enabled him to conclude that the illness existed a probable number of weeks, months, or years prior to the time that the patient presented himself for care.

The patients' primary diagnoses fell into sixteen categories of the International Statistical Classification of Diseases as Table II indicates. Heart disease, in some one of its forms, accounted for almost half of the diagnoses. Diabetes was the second most common primary diagnosis in the group.

PROCEDURE

Information was obtained from patients through personal interviews, by use of an interview guide as described below. Two nurses, one an instructor in the outpatient nursing service of a large voluntary hospital, and the other a supervisory interne in a voluntary visiting nurse agency, conducted the interviews in their respective work situations during the first six months of 1956. The Public Health nurse interviewed Home Care patients in their homes, after she had completed their treatment. Clinic patients were interviewed while waiting to see the doctor at their regular visits to the Outpatient Department. If, during the interviews, any response from a patient was elicited which would normally require explanation by a nurse offering professional service, the explanation was temporarily withheld until completion of the interview, with the comment that patient and nurse would explore that problem together a little later. Interviews lasted about 30 to 40 minutes.

The interview guide was constructed by the investigators, who had first pretested it with 20 patients not included in this study. The pretest resulted in the rewording of certain questions for greater clarity or meaningfulness. It also brought to attention the fact that patients, especially those with a long history of illness, showed some difficulty in recalling time according to the accepted calendar units of weeks, months, and years. Often, although they replied with certainty, they dated their answers to relate to other episodes of illness. Reported estimates of time must, therefore, be considered only rough approximations. After appropriate revisions, the interview guide consisted partly of "closed" questions with simple check-answers, and partly of open-end or free-answer questions, amplified by specific probes. Answers to the latter type of question were recorded verbatim as accurately as possible. Copies of the interview guide are available upon request.

Alterations in Patterns of Sleep.—The vast majority (44 patients) reported changes in their sleeping patterns since the onset of the present chronic illness.* These changes related variously to the problem of getting to sleep and staying asleep, the use of sedatives, and sleeping arrangements.

Getting to sleep and staying asleep: Thirty-one patients reported more difficulty in getting to sleep than they had prior to the onset of illness. Eighteen of these persons attributed their difficulty to "worry" about various sorts of physical discomfort.

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*Since the patients in this study were not matched with healthy persons in similar age groups, it is unfortunately impossible to state whether the incidence of reported change was due entirely to the presence of a chronic illness or whether some would have occurred as a natural consequence of aging, regardless of disease. There was no evidence, however, that the oldest patients in the study slept less well or had more changes than younger patients in the sample.

Asked to identify the problems about which they worried, 12 of the 31 patients answered that they worried about the consequences of illness or the likelihood of death. Others worried about family problems or the effect of their own illness on the family. Three who reported difficulty in sleeping because of worry were found to live alone with no one on whom to call in the event of a night emergency. The types of physical discomfort also varied. Twelve patients named physical symptoms other than pain; 7 attributed their difficulty in getting to sleep to positional discomfort, 3 to restlessness, and 3 to not being tired enough to sleep. Two other patients mentioned combinations of these reasons. Of considerable interest is the fact that only one of the group gave pain as a reason for difficulty in getting to sleep.

Forty-three patients reported the problem of awakening during the night, although two of this group had been troubled occasionally by the problem before becoming ill. Asked how often they awakened during a typical night, their answers ranged from one to three or more times (Table III). Some qualified their remarks by commenting that the greater frequency of awakening occurred after taking diuretics. But many reasons other than diuretics were mentioned as causes for awakening. The most frequent of these was the need to void (28

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TABLE III. THE INCIDENCE OF NIGHT AWAKENING

RESPONSE	NUMBER
Usually not at all	7
Once a night	9
Twice a night	12
Three times a night	7
More than three times	7
Many times after diuretic	4
Vague	4
Total	50

TABLE IV. REASONS GIVEN BY 43 PATIENTS FOR AWAKENING AT NIGHT

OTHER REASONS GIVEN	NEED TO VOID		
	YES	NO	TOTAL
No other reason	12	—	12
Pain	1	3	4
Positional discomfort, cramp or spasm in leg	6	2	8
Rapid heart, dyspnea, hot flush	3	1	4
Coughing, choking	2	2	4
Itching	2	—	2
Outside noise	2	2	4
Habit	—	2	2
Vague, don't know	—	1	1
Combination of reasons	—	2	2
Total	28	15	43

patients, including both users and nonusers of the diuretic drugs), and the next most frequent, positional discomfort (8 patients). Table IV correlates the respondents' comments on the need to void as a cause of awakening with the other recognized causes. From this table it appears that certain of the most frequent reasons for awakening might be overcome by more thoughtful planning of nursing care: i.e., diuretics given early in the day and more attention given to positioning in bed.

The use of sedatives: Only 18 of the patients are regularly taking "sleeping pills." Five more have abandoned the habit, although at some point in their illness they have used them on a nightly basis. These 5 patients reported that they slept well without them and were relieved not to be dependent on such medications any longer.

One-third of the 18 patients have been using "sleeping pills" for less than a year. Nine have used them for more than a year but less than five years, and 3 patients have been regularly habituated for five years or longer. (The respondent who used a sedative drug "occasionally" was not considered in this group.)

Sleeping arrangements: Forty of the 50 patients reported changes in their sleeping arrangements. These ranged from radical relocation of sleeping facilities to major and minor changes in sleeping position. Many of the positional changes necessitated the use of special equipment: Gatch bed, footboard, bed board, more pillows, etc.

Twelve patients specified that sleeping arrangements in relation to the spouse had changed. In some of these cases it was the patient whose bed was moved, in others it was the spouse who changed location. On nine occasions the sleeping arrangements of the patient were changed in relation to a person other than the spouse. Eight of the 50, it will be remembered, lived alone and thus had no opportunity to change their sleeping arrangements in relation to another person.

Only 7 of the 50 patients reported needing the help of someone else at night. As it happened, all of these had someone on whom they were able to call. This was not true, however, for all who might require assistance. Four of the clinic patients and two on the Home Care programs could not get help in emergencies. All patients were asked how they felt about this situation (the inability to summon help, if necessary, during the night). Of the 44 to whom help was available if needed, 22 expressed relief that this was so. Fourteen others mentioned their reluctance to bother anybody. Two were apparently unconcerned, and one stated that he would prefer the security of an institution. Of the 8 who lived alone, 2 reported relative security at night because of the interest of neighbors who could be summoned if the patient knocked on the wall or steam pipe. One more was able to reach a neighbor by telephone. Five patients remained who expressed concern over not having anyone to whom to turn in emergencies. Four other patients were troubled by the physical infirmities of the persons to be called on. In one case, this constituted the major source of worry.

Patients' comments: Patients' spontaneous comments during the interviews graphically described their feelings and attitudes toward chronic illness:

"Everything is different when you live in bed most of the time for 3 months. It's like Alice in Wonderland. . . "

"I must sleep sometimes, but it seems as though I walk the floor at night. . . can't hear, can't see, can't go outdoors, nobody to talk to, nothing to be interested in. . . worry all the time. I'm no good. . . no one to take care of me. . . what does an old man like me have to live for?"

"Well, that's the way it is if you don't have folks. The night clerk on the (hotel) desk is a friend. . . he'd look in if he thought something was wrong."

"I moved the bed next to the wall near the radiator riser so I can knock on the pipe to a friend downstairs for an emergency. . . but I have never had an emergency."

Alterations in Patterns of Eating.—Forty-four patients reported changes in their patterns of eating. These related to quantity, specific diet, time of meals, and companionship while eating, as well as to responsibility for the preparation of food.

Additions to and deletions in the diet: Detailed discussion of specific items eliminated from the diet or added to it revealed that 40 patients were avoiding one or more specific foods because of illness, while 27 had added foods not previously eaten. More than half of all patients were on a low salt diet which had been medically recommended, but only 3 of the 26 included in this group said that they had substituted such items as salt-free bread and butter. Many simply deleted the salted items from their menus without formally planning any substitutions. Table V combines the findings reported in their dietary changes. Reading down, it shows what foods the patients are avoiding. Reading across, it shows the new foods added.

TABLE V. CHANGES IN DIET BECAUSE OF ILLNESS, AS REPORTED BY 50 PATIENTS

FOODS TO BE LIMITED	FOODS TO ADD						
	NONE	PROTEIN	BABY FOOD	SALT-FREE BREAD AND BUTTER	FRUITS AND VEGETABLES	MISC.	TOTAL
None	8	0	1	0	0	1	10
Salt	7	2	0	2	2	3	16
Carbohydrates	1	0	0	1	3	2	7
Fats and oils	0	0	0	0	0	0	0
Salt and carbohydrates	4	0	0	1	2	2	9
Solid foods	0	0	1	0	0	2	3
Solid foods and fats	0	0	0	0	0	1	1
Miscellaneous	3	0	0	0	0	1	4
Total	23	2	2	4	7	12	50

Appetite: Thirty-four patients reported that their appetites had been altered by their illnesses. Many patients showed sound understanding of physiologic and psychologic problems which influenced this change, and described

clearly the ways in which patterns had been altered. Table VI summarizes the ways in which they reported their appetites to have changed.

Five patients who reported appetite changes were unable to give a reason for them. Seven said they were often "too tired to eat," while 10 attributed the changes to "worry." Pain, in combination with other factors, was mentioned by 11 patients. No respondent reported pain as the sole reason for loss of appetite.

TABLE VI. CHANGES IN APPETITE REPORTED BY 50 PATIENTS

TYPE OF CHANGE	TOTAL
Less hungry	13
More hungry	4
Drinking less	0
Drinking more	0
Varies according to how patient feels	3
Disinterested in food	8
Too nervous to eat	5
Less hungry, drinks less	1
Less hungry, drinks more	1
None	15
Total	50

Companionship during meals: For 23 patients accustomed to companionship at mealtime, life has undergone considerable change since the onset of the chronic illness. Eighteen patients were found to eat alone at all times, and three of these used restaurants. Twenty-one patients ate at home, still taking most of these meals alone, but ate out with other people on occasion. It is difficult to assess such an intangible as loneliness, yet in response to the question, "With whom do you eat?" the loneliness of certain patients showed itself more clearly than when any other questions were being answered.

Time of eating: Thirty-four of the patients are now eating at different times because of illness. In some instances, this represents greater regularity in eating habits. In others it occurs because of smaller and more frequent feedings, and with some because of increased indifference to food.

Cost of food: Twenty-four patients reported that food costs more because of illness. In the reasons given for this lies one of the most interesting findings of this study: 19 of the 24 patients reporting higher food costs have actually *improved* their basic diet since the onset of their illness. Many volunteered the information that because of their dietary problems they had learned enough about nutrition to improve the diet of the entire family. Acceptable evidence was offered by these patients to support their statement. In contrast, 3 patients were found to prepare entirely separate special diets for themselves, which had little relation to foods prepared for regular family use. These 3 unnecessarily increased both effort and cost of meal preparation. Other factors which increased the cost of food in illness included the necessity for depending upon less skillful shoppers (children or neighbors) to do the marketing, and the need to use restaurant facilities for eating.

Cooking habits: In 18 cases the patient was the cook. The majority of these were hospital clinic patients. Only 4 of those on Home Care were responsible for the preparation of food. This is to be expected because these patients, in general, were sicker and also included a larger number of men. In 13 cases the patient's spouse prepared the meals. Other family members cooked for 11 patients, leaving 8 to be accounted for in miscellaneous fashion (meals in restaurants, prepared by neighbors, etc.). The patients who cooked for themselves were found in households of all sizes.

Patients' comments: Verbatim comments about eating which are of special interest follow:

"I took in a boarder chiefly so as not to be alone at night. . . now I enjoy my food more, with another person to eat with. The food seems more interesting."

"The biggest change in sickness is trying to cut down activity because I am short of breath. I can't clean. . . can't shop. . . can't have company. . . can't take care of my grandchildren. . . but I do eat better now. I know more about food and what I need."

"The biggest change has been in the children. I get more excited now and scold too much. But I have learned more about what food can do and I feed the children better."

"I don't spend more money for food since I've been sick, but I eat more sensibly and I get more food value for what I spend."

DISCUSSION

Most of the 50 patients who were interviewed were found to have had some sort of change in their sleeping and eating habits since the onset of chronic illness. A larger proportion of changes which could be classified as disturbing were found in the patterns of sleeping than in the patterns of eating. In the latter field, patients reported some changes for the better. Although a control group of healthy persons, matched for age, would be required to determine definitively whether the reported changes were attributable primarily to the presence of chronic disease, the findings clearly suggest that unhospitalized patients who are chronically ill face a variety of problems in daily living which perhaps need more professional attention than they have hitherto received.

Many of the patients in the study group were lonely people whose problem of sleeplessness had received little attention from the hospital staff. The patients' relief at night was often obtained through their own trial-and-error approach to problem solving. This method was used to relocate beds, provide for help in emergencies, and modify activities. Nearly a hundred years ago in *Notes on Nursing*, Miss Nightingale wrote of the importance of the nurse's identification of these problems by "precise rather than by leading questions." She continued:

> If a patient sleeps two or three hours early in the night and then does not sleep again, ten to one it is not a narcotic that he wants, but food, or stimulus, or perhaps only warmth. If, on the other hand, he is restless and awake all night and is drowsy in the

morning, he probably needs sedatives: either quiet, coolness or medicine, a lighter diet, or all four. Now the doctor should be told this or how can he judge what to give?

There is some evidence in this study that certain patients' difficulties in the area of sleep might be alleviated by closer attention to diet. Several patients commented spontaneously that since eating more regularly and adhering to the recommended diet, they felt more comfortable physically, were able to undertake more activity, and thus were more ready for sleep or slept more comfortably. Nurses who encounter problems of sleep in patients with chronic illness would, therefore, do well to take a careful diet history and, when appropriate, teach the importance of diet in combating fatigue.

Worry, inactivity, and confinement to living quarters were reported as sources of sleeping problems so frequently that measures to counteract these influences seem much needed. The lack of "something to do" was mentioned often enough to suggest the need for more attention to occupational therapy facilities for homebound patients than is presently being given to this problem. More particularly, thought needs to be given to the importance of extending occupational therapy facilities to patients enrolled in organized Home Care programs,* and to hospital clinic patients who are confined and who would profit by these. Other community agencies could well review the problem of homebound patients' needs for more recreational outlets.

The need to be concerned with fresh air, variety—even within the confines of four walls—and perhaps planned, reliable, friendly visiting to the homebound patient under the auspices of a health or welfare agency is documented by the replies of patients in this study, as is their need for more active participation in lieu of passive acceptance. It seems desirable that nurses should include in the patient's plan of care details of activities of daily living, noting resources and equipment which might be utilized to help patients live more contentedly within their limitations, and noting also immediate as well as long-range goals.

Of real concern in community planning is the picture which emerged of the status of chronically ill patients who live alone. Six of the 8 in this study who lived alone were seriously debilitated men and women; 5 had no one on whom to call in night emergencies, and the other 3 were dependent upon neighbors. Their situation is scarcely conducive to security. Although the sample is too small for the statistical picture to be convincing, the real-life plight of this 16 per cent is cause for concern and perhaps remedial action on the part of community agencies.

There was wide variation in the patients' use of sedatives and great confusion in their understanding of the reasons why these drugs had been prescribed or withheld by the physician. Replies to questions in this area were marked by strong emotion. A study directed toward ascertaining patients' attitudes toward sedation, physicians' attitudes, and the interaction between the patient and the doctor as related to the prescription and taking of "sleeping pills" might well be a productive first step in clarifying the sources of confusion and emotion.

*These facilities are available in certain Home Care programs but not in all.

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Because mealtime is a socializing time in our society, this study shows frequent mention of family members in the replies to questions about eating habits. The impact of illness on the family was most readily documented by patients' spontaneous comments about food. Loneliness, degree of activity, participation within the family group, and response to teaching were all effectively demonstrated here. There seems to be little doubt that patients accept diet restrictions imposed by illness with more insight than they do alterations in their sleeping habits. One reason for this may be that dietary changes are usually medically imposed and preceded by some discussion. A second reason may be that dietary changes, at least in this study group, were usually accompanied by useful health teaching, the effectiveness of which was frequently demonstrated in the reported patterns of change. Patients appeared sufficiently responsive to diet change so that some were able to apply their new understanding of good nutrition and preparation of palatable food to improving the diet of the entire family. That they adjusted their own meals to their special diets as a modification of the family's meals is evidence of their own readiness for learning and their doctor's, nurse's, or nutritionist's ability to do imaginative teaching.

Interestingly enough, no patient in this study cited financial problems as a primary concern, although all were in a low income category and many were receiving public assistance. There was opportunity for them to call attention to financial pressures in both the sleeping and eating sections of the interview, yet they did not do so. It would be interesting to repeat this study with a higher income group of patients, responsible for their own payment for medical care and other necessities, to discover whether they would express more concern about financial pressures.

The 50 respondents seemed interested in discussing patterns of sleeping and eating and appeared to appreciate the attention focused on these two areas of daily living. They talked readily about their sleeping and eating habits, and their spontaneous comments brought to light many other problems of physical and emotional adjustment. An interview guide such as the one used in this study appears to be a useful tool for the nurse-patient health conference. Further experimentation is needed to discover to what extent it can be used to obtain research data and to help the nurse identify patients' needs more precisely and assist her to perfect her interviewing skills. The evidence accumulated in the present study suggests that even though nurses carry a regular work schedule, they can with profit to their patients and to themselves participate in nursing research.

SUMMARY

An interview guide was devised and administered to 25 homebound and 25 ambulatory patients with chronic illness in order to determine their nursing needs. A particular purpose of the interviews was identification of changes in the patients' eating and sleeping habits and problems arising therefrom that might be solved by better nursing care.

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Nearly all the 50 patients interviewed were found to have some change in sleeping and eating habits since the onset of chronic illness. There was a larger proportion of disturbing changes in sleeping patterns. Some patients had actually improved their eating habits as a result of diet instruction in connection with their treatment.

Various ways that nursing care may be improved as a result of identifying problems through the use of an interview guide are discussed. It is concluded that much can be done along these lines to contribute to the welfare and comfort of patients with chronic illness.

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Editorial

TRACEMETALS

THE past twenty-five years have seen remarkable advances in our understanding of nutrition, based principally on the results of biochemical investigations of plants and animals, including man. Progressively, investigators have turned their attention from the more easily studied bulk of body mass to enzymes, hormones, vitamins, and metals which, though present in minute quantities, nevertheless exert powerful influences in plants and animals alike. Although earlier investigators were well aware of the existence of problems involving these substances, research on them was delayed because instrumentation was either not available or not sensitive enough to deal with quantities present in concentrations as low as thousandths and millionths parts of grams.

More than 60 elements have been discovered in bacteria, fungi, higher plants, animals, and man. The role and occurrence of most of these elements have not been studied intensively. Investigation has necessarily been restricted to those occurring in amounts large enough to be measurable, even if not always precisely, by available techniques: calcium, carbon, chlorine, hydrogen, iodine, iron, nitrogen, oxygen, phosphorus, potassium, sodium, sulfur, and magnesium (although the last has presented difficulties in analysis). *Trace elements, micronutrients, microelements, minor elements, and oligoelements* are terms applied to the remaining elements occurring in biologic systems in minute quantities.

The following are generally included among the trace elements: aluminum, antimony, arsenic, barium, boron, bromine, cadmium, chromium, cobalt, copper, fluorine, gallium, lead, lithium, manganese, mercury, molybdenum, nickel, rubidium, silver, strontium, tin, titanium, vanadium, and zinc. These elements have been grouped together quite arbitrarily. They have in common (1) the difficulty of measurement in biologic fluids because of low concentration, which varies from 1×10^{-6} to less than 1×10^{-12} Gm. per gram wet organ, and (2) a resistance to definite appraisal as to physiologic function.

MEDICAL IMPLICATIONS

Iron, iodine, and fluorine have virtually been removed from the group considered as trace elements, and their medical significance is no longer questioned. In a 70 Kg. individual there are 4 to 5 Gm. total iron and 30 to 60 mg. iodine. This may be contrasted with about 20 Gm. of magnesium, 2 to 3 Gm. of zinc, and about 100 to 150 mg. of copper in the same individual; these latter are considered trace elements at present. It is clear that concentration of an element in bio-

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logic matter is *not* the sole criterion of either its importance in health and disease or the extent of knowledge concerning it.

The evolution of knowledge in this field has been slow. Most of the information has been accumulated in the last thirty years, though interest in many aspects of the problem dates back at least one hundred years. The presence of copper in the oxygen-transporting hemocyanin of mollusks was first recognized more than a century ago.[1] Studies on hydroponics in 1860[2,3] provided a concrete demonstration that plants require trace elements for growth, while J. Raulin's[4] work in 1869 with *Aspergillus niger* extended this concept to fungi. E. Baumann's[5] classic discovery of iodine in the thyroid (1895) pointed to the essential role of an element of high atomic weight in the control of mammalian metabolism. Iodine had been used empirically seventy-five years earlier as an effective remedy for goiter.[6] C. Bernard's[7] investigations on cell respiration, those of C. A. Mac Munn[8] on cytochrome, and the studies of W. Spitzer[9] on iron and oxidative processes gave first suggestions which eventually led to the discovery of metalloenzymes (enzymes containing a metal as an indispensable part of the molecule) and of metal/enzyme interactions in catalysis. These investigations of the biochemical role of the trace elements have been carried forward by many workers enhancing our understanding of the role of these elements in the nutrition of microorganisms, higher plants, and animals.[10,11]

Determination of the concentration of trace elements, like that of other metabolites, in tissues, cells, subcellular particles, and fluids is a corollary to the elucidation of their role in disease. This knowledge has awaited the development of techniques and methods permitting the determination of minute concentrations of elements with precision. Through advances in chemical and physical knowledge, gained as recently as the past decade, great strides have been made in the design of techniques and methods which make possible precise determination of minute concentrations of elements. More important yet, these technical advances have permitted the formulation and testing of hypotheses not previously susceptible to experimentation.

Microchemistry,[12] polarography,[13] and emission spectrography[14] have been advanced to a point where determinations of trace metals may be accepted with greater certainty than would have been advisable twenty years ago.

Many other techniques show great promise of becoming similarly useful.[15] Of these techniques, emission spectrography is peculiarly suitable. It permits the simultaneous, quantitative assessment of some 20 to 30 elements of biologic interest occurring in concentrations varying from 1×10^{-6} to 1×10^{-9} Gm. per gram of wet tissue. For individual elements absolute sensitivities of 1×10^{-12} Gm. per gram of tissue may be reached in amounts of sample containing less than 10 mg. of ash. It thus becomes possible to ascertain the *patterns* of distribution of these elements in normal systems and their deviations in pathologic ones. The coincident use of isotope studies would add further physiologic significance to such data by elucidation of the dynamics of the systems investigated. The development of yet more sensitive tools presently under way offers hope of measuring even lower levels of concentrations of the trace elements.

Tracemetal deficiency states in nature[16] were emphasized by the discovery in Holland of severe copper deficiency diseases in plants and in animals using these deficient plants as fodder. This was soon followed by the discovery of cobalt deficiencies in sheep in Australia.[17] The subject has been reviewed by Marston[18] and Underwood.[11]

The search for an explanation of the physiologic role of the trace elements has emphasized their association with enzyme systems in living cells. Enzymes which contain a metal as part of this protein structure have been termed *metalloenzymes.*[19]

A *metalloenzyme* contains a metal as an integral part of the molecule. When the element is split from the protein, all measurable biologic activity is lost. Some metals are parts of prosthetic groups, as found in hemoglobin, catalase, or peroxidase. This group of compounds has been isolated by protein fractionation followed by the measurement of enzyme activity and metal content. Though only few of these metalloproteins, which may be considered as a class of biochemical substances, have been obtained from human sources, their significance with respect to the biochemistry, physiology, and pathology of man is becoming increasingly clearer, since their action in different species is analogous. Structurally, chemically, and biologically similar metalloenzymes are found in a variety of phyla, demonstrating that these enzymes are significant in the biochemical processes of species of widely diversified evolutionary histories, and thereby indicating their general metabolic importance.

It has been discovered recently that several enzymes, among which alcohol, lactic, and glutamic dehydrogenase as well as carboxypeptidase, contain zinc, a metal that heretofore had only been known to occur in carbonic anhydrase.[19,20] This has led to the detection of profound disturbances in zinc metabolism in postalcoholic cirrhosis.[21,22] It may be anticipated that the detection of other, similar enzymes may lead to new avenues of approach to long-standing clinical problems.

If hemovanadin, a vanadium-containing protein of ascidian blood[23] as yet incompletely characterized, is also included, it is seen that these metalloproteins incorporate transition elements between atomic numbers 23 to 30. Only these metals have thus far been found to be joined to proteins by bonds sufficiently strong to allow their isolation as metalloproteins. Proteins or other organic compounds containing the elements 24 (chromium) and 28 (nickel) have not been isolated from biologic material so far. From the similarity of their atomic structure, it has been predicted that they will be found in metalloproteins or other organometallic compounds of biologic importance.[30] Similarly, cadmium has been expected to play a biologic role since its atomic configuration and, therefore, its chemistry is quite similar to that of zinc. Recently a protein containing 4 per cent cadmium (!) has been isolated from the cortex of the kidney of the horse.[24] Though its function is still unknown, this finding implies that cadmium, like other trace elements, serves a distinct physiologic role. Speculations on the element's etiologic significance in hypertension as a "toxic" factor do not seem well supported by the discovery of a physiologic moiety containing cadmium.[25]

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The biophysical and biochemical study of these elements has not been systematic. There is a general lack of accurate quantitative chemical data in normal and pathologic states. In all of such work, valid criteria of biologic effectiveness have been difficult to establish. Deprivation, intoxication, or balance studies on plants and animals have usually been aimed at the production or prevention of abnormal states identified by symptomatology and/or pathology. Because these elements appear to be biologically active in concentrations of less than one millionth of a gram per gram of biologic substance, these types of experiments have not always proved as helpful as they have in other fields of nutritional research. The choice of rigidly controlled chemical environment, appropriate dietary intake, and good experimental material is even more critical for the success of such experiments than usual.

Since the conventional means of experimental pathology have often failed to give decisive answers, it seems particularly important that valid criteria for the appraisal of biologic effectiveness of trace elements be established, if some of the vagaries of the investigative efforts are to be removed and their scope is to be extended. A relatively new approach in this regard is exemplified by the study of enzymatic activities of tissues subsequent to the establishment of a metal deficiency in microorganisms, animals, and plants.

In studies of zinc-deficient animal tissues, changes in enzymatic patterns, possibly characteristic of zinc deficiency, were sought and found. These alterations in enzyme activities were not reversible with the addition of zinc to the tissues in vitro.[26,27] Similar results have been obtained in *Neurospora crassa*[28] where subsequent to zinc deficiency marked deviations in the pattern of some enzymes were observed, and studies in tomato plants have suggested marked changes in protein metabolism.[29]

The medical knowledge currently available for cobalt, cadmium, copper, fluorine, magnesium, and zinc has been summarized recently and need not be restated here.[30]

Tracemetals and the many avenues of approach to medical problems which they suggest have incited much speculation and hypothesis. Reasoning by analogy, while often helpful in the delineation of crucial experiments, has frequently replaced experimentation—or it has lead to superficial inspection of the premises in order to confirm popular prejudices. No wonder then that these circumstances, coupled with the obvious experimental difficulties of appraising the true significance of the field, have lead to skepticism among serious investigators. Tracemetals and the biologic problems with which they are associated have therefore acquired a somewhat base, ignoble, and mystical connotation among many.

Where the physician is baffled in his efforts to advance a plausible and logical hypothesis on the etiology of a malady, sooner or later the literature is enriched by a "Tracemetal Hypothesis." The many problems of chronic diseases have been a happy hunting ground: cancer, arteriosclerosis, hypertension, arthritis porphyria, lupus erythematosus disseminatus, multiple sclerosis, and other diverse neurologic maladies, and even brucellosis, all have, or have had, their more or less plausible "tracemetal day." While the evidence is often sparse—and

sometimes nonexistent—serious pursuit is frequently hampered by low levels of intellectual acceptance. Some of this resurgence of interest in the relationship of metals to chronic diseases has likely been sparked by the discernment of the role of metals in pernicious anemia, Wilson's disease, and postalcoholic cirrhosis.

It was not suspected that cobalt baers any relationship to pernicious anemia, and the discovery of 4 per cent of this element in vitamin B_{12} was a surprise. If the conjecture had been advanced—prior to the discovery of vitamin B_{12}—that cobalt is a significant factor in the treatment of pernicious anemia, pharmacologic experiments with this element alone to verify this thought would have been negative. Only when the cobalt is incorporated into the molecule of vitamin B_{12} is the therapeutic significance realized. An oversimplified hypothesis, although close to the truth, would have lead to negative answers.

Casual inspection unfortunately fails to emphasize that all of these advances have been accomplished as a result of much painstaking basic research extending over many years. Nor is it acknowledged that the pertinent basic facts have usually been gathered in areas of the natural sciences, superficially quite remote from the pressing medical problems to which they have become applicable.

The management of incurable maladies is prone to evoke frustration, contemplation, and action on the part of those who must face the dilemma and the challenge. However, a casual perusal of the complexity of the facts, but briefly outlined in this discussion, may convince the reader that inductive reasoning may be a necessary but is far from a sufficient procedure to discern a possible role of these metabolites in diseases. Such efforts, although well intentioned, are likely to be misleading rather than beneficial in a field which is plagued by a great paucity of basic knowledge with predictive capacity. Nor does the invocation of physical-chemical constants or biochemical mechanisms improve matters much. In such circumstances it may be well to heed the warning that "motivation and honesty are no excuse for insufficient evidence."

Clearly the field of trace metal metabolism is in its medical infancy. It is neither daring nor very imaginative to prognosticate a future of increased medical significance for tracemetals, both in the recognition of etiologic mechanisms of diseases and in their therapy. Much progress may be expected from the accelerating rate of basic research which is unraveling the complex relationships of the cellular apparatus. Tracemetals will likely provide yet another demonstration that the biologic significance of a metabolite may be related inversely to its diminutive quantitative occurrence.

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Book Reviews

REHABILITATION MEDICINE. By Howard A. Rusk, M.D. St. Louis, 1958, The C. V. Mosby Co. Pp. 572, indexed. Price $12.00.

This is a well-arranged textbook written by Howard A. Rusk and thirty-six collaborators at the Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center. The first fifteen chapters give the principles of evaluation, therapeutic exercise, occupational therapy, nursing, and other technical aspects of rehabilitation. In the second part, the application of these principles to specific diseases is described.

Because of the limited number of physiatrists and rehabilitation centers throughout the country, the task of bringing rehabilitation to most patients falls largely on the neurologist, orthopedist, internist, or general practitioner. This book is especially designed for physicians seeking to learn more about the specialized techniques of rehabilitation. The methods described are those used in a large rehabilitation center and are elaborate and extensive. The physician who does not have such facilities at the disposal of his patients may feel helpless to supply them himself. If he understands the principles of rehabilitation, however, he can do a good deal on his own and may be able to mobilize the resources of the community to render better services to his patients.

This book presents the best rehabilitation therapy. Such facilities should be available to all disabled patients.

Douglas Carroll

CHEMOTHERAPY AND THE CENTRAL NERVOUS SYSTEM. By Henry McIlwain, Ph.D., D.Sc. Boston, 1957, Little, Brown & Company. Pp. 328, indexed. Price $10.00.

Professor McIlwain is an interesting fellow, and he has written an interesting book. A biochemist with a long-standing interest in drugs, he has written a pharmacologic treatise with an off-beat approach which I found quite fascinating. Although most of the material is not new, McIlwain's brisk style and unhackneyed orientation make the well-traveled roads look like terra incognita. The author's interest in historical development helps considerably, and for American readers there is the added bonus of an emphasis on European literature too often lacking in our own reviews.

There are only a few criticisms. Either the author is a sloppy note-taker, or a bad proofreader: Sertürner's ghost would be unhappy to see the name spelled with an extra "t"; Mr. Eli Lilly would likewise resent an extra "e" in his name, etc. There are occasional errors of fact (the author correctly refers to the classic Piedmontese controlled trial of hypnotic drugs, but names the wrong barbiturate) but they are rather few. Perhaps the only other critical point worth making is to disagree with McIlwain (and side with Fourneau) on the present importance of rational, logical chemical synthesis of new compounds or superior congeners of old ones. This book is eloquent testimony to the remarkable frequency with which frenzied chemical activity has failed to improve on the original drug. Perhaps with more McIlwains, however, pharmacology will soon be able to raise its batting average in this respect.

Send the book to your favorite pharmacologist for Christmas.

Louis Lasagna

ELECTROCARDIOGRAPHY. By Michael Bernreiter, M.D., F.A.C.P. Philadelphia, 1958, J. B. Lippincott Company. Pp. 134, indexed. Price $5.00.

This book is a useful addition to the literature on electrocardiography. Its purpose is to outline the basic electrical principles before proceeding to an account of the common abnormalities seen. It is directed mainly to the medical student, the general practitioner, and the internist. The initial section, dealing with electrical events, the effect of position on the electrocardiogram, and the genesis of the precordial leads is highly recommended. The later sections on the arrhythmias and myocardial infarction are also concisely and clearly discussed. Some of the intervening sections are a little less comprehensive by comparison.

There are 91 illustrations, and these are clear and well reproduced. It would have been better if the illustrations could have been more often adjacent to the text dealing with them. This has been overcome partially by including quite full captions to most of the figures, but does not make for smooth reading and leads to a fair amount of repetition.

These criticisms, however, do not detract from the intrinsic value of the book, and the author has succeeded in attaining the aims which he outlines in the preface. This book should be particularly helpful as a quick source of reference to the busy doctor, whether he be in practice or in hospital.

Keith Manley

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PSYCHOPHARMACOLOGY. Pharmacologic Effects on Behavior. Edited by Harry H. Pennes, M.D. Vol. III of Progress in Neurobiology, edited by Saul R. Korey, M.D., and John I. Nurnberger, M.D. New York, 1958, Paul B. Hoeber, Inc. Pp. 362, indexed. Price $8.00.

While few scientists doubt that some day we shall be able to treat and control mental disease as effectively, say, as infectious disease, that day seems far off. So far, in fact, that I am continually amazed that so many psychiatrists, physicians, and even scientists, encouraged by what is only the limited success of the "tranquilizers," proclaim the imminent conquest of this type of illness.

The present volume reports the proceedings of a symposium that included representatives from several of the basic sciences and clinical medicine. Reading it provides excellent therapy for hypersanguinity. Several of the contributors and participants themselves underscore the vast areas of confusion, doubt, and ignorance that surround us. But this point is made even more cogently by the total impact of the volume, just because it includes contributions from people who are active in this field of research and who talk about the problems and controversies that beset their own special areas.

Still, as Gilman, one of the discussants, says, one useful result has appeared that can be ascribed to the "psychotomimetic" and "psychotherapeutic" drugs: the interest of basic scientists has been aroused. Perhaps the stage is now set for a happy accident.

Bernard Weiss

Symposia to Appear in Forthcoming Issues

SYMPOSIUM ON OCCUPATIONAL MEDICINE

GUEST EDITOR,
LEONARD J. GOLDWATER, M.D.

To appear in an early issue of the JOURNAL OF CHRONIC DISEASES

CONTENTS

Introductory Statement to Symposium on Occupational Medicine. Leonard J. Goldwater, M.D., Columbia University, New York, N.Y., and Melvin M. Udel, Research Associate, Columbia University, New York, N.Y.

Employment of the Chronically Ill. Raymond Murray, M.D., Medical Director, Sperry Gyroscope Company.

Use and Abuse of Periodic Health Examinations in Industry. Norbert J. Roberts, M.D., Associate Medical Director, Standard Oil Company, New York, N.Y.

Pneumoconioses. Morris Kleinfeld, M.D., Director, Division of Industrial Hygiene, State of New York Department of Labor.

Industrial Use of Ionizing Radiation. Irving R. Tabershaw, M.D., Columbia University, and Director of Health and Safety, Nuclear Development Corporation of America, New York, N.Y.

Industrial Noise and Its Effects on Hearing. Meyer Fox, M.D., Milwaukee, Wis.

Berylliosis. Harriet Hardy, M.D., Occupational Medical Service, Massachusetts Institute of Technology.

Economic Poisons. Robert E. Gosselin, M.D., Dartmouth Medical School.

New Materials of Significance in Industrial Toxicology. Charles H. Hine, M.D., Berkeley, Calif.

Modern Views on Ancient Poisons—Lead and Mercury. Heinrich Brieger, M.D., Professor of Industrial Medicine and Director of the Division, Jefferson Medical College of Philadelphia, Philadelphia, Pa.

SYMPOSIUM ON PSYCHIATRIC DISORDERS

GUEST EDITOR,
LAWRENCE C. KOLB, M.D.

To appear in 1959 issue of the JOURNAL OF CHRONIC DISEASES

CONTENTS

Introductory Statement to Symposium on Psychiatric Disorders. Lawrence C. Kolb, New York, N. Y., Guest Editor.

The Role of the Physician in the Prevention of Mental Illness. Ernest M. Gruenberg, Associate Clinical Professor of Psychiatry (Epidemiology), Columbia University, and Milbank Memorial Fund, New York, N. Y.

The Anxiety States. Lawrence C. Kolb, Director New York State Psychiatric Institute and Psychiatric Service, Presbyterian Hospital; Professor and Chairman, Department of Psychiatry, Columbia University, New York, N. Y.

The Psychoneuroses and Their Management in General Practice. C. Knight Aldrich, Professor and Chairman, Department of Psychiatry, University of Chicago, Chicago, Ill.

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The Treatment of Mental Disorders in Old Age and the Rehabilitation of the Chronically Ill Aged. Alvin Goldfarb, Consultant on Services for the Aged, State of New York, Department of Mental Hygiene, New York, N. Y.

The Depressive Illnesses: Their Diagnosis and Management. J. S. Gottlieb, Director, Lafayette Clinic, and Professor of Psychiatry, Wayne University, Detroit, Mich.

Ambulatory Schizophrenia. Marc H. Hollender, Professor and Chairman, Department of Psychiatry, State University of New York, Syracuse, N. Y.

Delirium: the Syndrome of Reversible Cerebral Insufficiency. George L. Engel, Professor of Psychiatry and Associate Professor of Medicine, University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

The Use of Modern Pharmacologic Agents in Psychiatric Disorders. Sidney Malitz, Acting Principal Research Scientist, Psychiatry, New York State Psychiatric Institute, Associate in Psychiatry, Columbia University, New York, N. Y.

The Challenge of the Partial Cure. Lawrence S. Kubie, Clinical Professor of Psychiatry, Yale University, New Haven, Conn.

The Psychosomatic Approach to the Hospitalized Patient. Eugene Meyer, Associate Professor of Psychiatry and Medicine, The Johns Hopkins University School of Medicine, Baltimore, Md.

Management of the Narcotic Addict. K. W. Chapman, Associate Director, The Clinical Center, National Institutes of Health, Washington, D. C.

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SYMPOSIUM ON CHRONIC CONGESTIVE HEART FAILURE

GUEST EDITOR,
DR. ALFRED P. FISHMAN

To appear in 1959 issue of the JOURNAL OF CHRONIC DISEASES

TENTATIVE CONTENTS

Pharmacology of the Failing Heart. Dr. John McMichael, Postgraduate Medical School of London, London, England.

Volume Receptors. Dr. Maurice B. Strauss and Dr. Solomon Papper, Veterans Administration Hospital, Boston, Mass.

Myocardial Metabolism in Congestive Heart Failure. Dr. Robert E. Olson, University of Pittsburgh, Pittsburgh, Pa.

The Lung in Congestive Heart Failure. Dr. Alfred P. Fishman and Dr. Gerard M. Turino, Columbia University, New York, N. Y.

Determinants of Venous Pressure. Dr. Arthur C. Guyton, University of Mississippi, School of Medicine, Jackson, Miss.

Physiologic Basis of the Therapy of Pulmonary Edema. Dr. Domingo M. Aviado, Jr. and Dr. Carl F. Schmidt, University of Pennsylvania, School of Medicine, Philadelphia, Pa.

Nutritional Heart Disease. Dr. Chester S. Keefer, Massachusetts Memorial Hospital, Boston, Mass.

Pathology of Congestive Heart Failure. Dr. Marvin Kuschner, New York University, College of Medicine, Bellevue Hospital, New York, N. Y.

Endocrine Factors. Dr. H. P. Wolff, I. Med. Klinik d. Universität, Munich, Germany.

Congestive Heart Failure in Children. Dr. Sidney Blumenthal and Dr. Dorothy H. Andersen, Columbia University, New York, N. Y.

The Kidney in Chronic Congestive Heart Failure. Dr. A. Clifford Barger, Harvard Medical School, Boston, Mass.

Hemodynamics. Dr. Kenneth W. Donald, Queen Elizabeth Hospital, Birmingham, England.

Autonomic Nervous System in the Pulmonary Hypertension of Congestive Heart Failure. Dr. D. Halmagyi, University Medical School, Szeged, Hungary.

Announcement

INFORMATION WANTED ON PROFESSIONAL PERSONNEL IN RHEUMATIC DISEASE FIELD

American Rheumatism Association's Committee for the Exchange of Information Concerning Faculty Appointees and Fellows

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Because of the number of new units for the study of rheumatic diseases that are being established in medical schools in this country and abroad, there has grown a need for information about available personnel to staff such units. There is also current need for information regarding fellowship and traineeship opportunities in rheumatic diseases in the United States and other countries and regarding potential and available candidates. Information is also needed concerning opportunities for temporary exchanges of personnel between medical schools here and abroad.

In the hope of assisting in collection and dissemination of information on these and related questions, the American Rheumatism Association has recently established a Committee for the Exchange of Information Concerning Faculty Appointees and Fellows (EICFAF). The Committee will be pleased to receive information about fellowship and traineeship opportunities and faculty and other staff vacancies, as well as inquiries regarding available personnel. Such information and inquiries should be addressed to: Dr. Currier McEwen, New York University College of Medicine, 550 First Avenue, New York 16, New York.

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